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A JOURNEY INTO RUB' AL KHALI—THE SOUTHERN ARABIAN DESERT: *A paper read at the Evening Meeting of the Society on 2 June 1930, by*

BERTRAM THOMAS, O.B.E.

Financial Adviser to H.H. the Sultan of Muscat and Oman

AFTER an absence of two years from South Arabia, I landed at Salala on January 8 this year with plans for a camel journey into Rub' al Khali, the great unknown southern desert. My arrival in company with His Highness the Sultan of Muscat made for a favourable reception of plans which might otherwise have been opposed, though in the most favourable circumstances the would-be traveller in that unwelcoming land lives in a state of disturbing uncertainty up to the moment of starting his journey. At the outset the local tribal situation is a deciding, albeit an incalculable, factor. Had my arrival coincided with tribal unrest in the Qara mountains the path would inevitably have been barred and all my carefully prepared plans frustrated. There is a considerable element of luck in the penetration of Arabia.

My hopes centred in certain elements of Al Kathir tribe whose headmen were, by the kind and influential offices of the Sultan, brought to the fort to discuss ways and means. Escorting Badus and camels were immediately available, but baggage camels—none would risk them even for gold, and they needs must be impressed from that déclassé tribe of the mountains, the Shahara, and then only for fabulous hire. This is another preliminary problem of desert exploration—the camel-owner will not risk other than the camel he rides to the unbeaten track, and the health of that one animal will, with him, outweigh every other consideration of the journey, so that if the traveller wishes to go far he had better be in a position to purchase the caravan at the outset: to promise adequate compensation for casualties is hardly enough.

The forenoon of January 11 found us on the march, an escort of twenty-eight mounted Badus, nine baggage animals, my secretary 'Ali Muhammad, and my servant who had accompanied me on my journey through the South-Eastern borderlands in 1928, forty camels in all. Three hours sufficed for crossing the crescent plain of Dhufar—the Jurbaib—where at 300 feet we turned into the Gurzaz, one of the few great wadis that give access to the Qara mountains. The

wadi, in contrast to the bare plain, immediately becomes thickly wooded. A tortuous path led up its gentle slope thick with overhanging foliage. The plashing of hidden streams which spring farther up in the wadi bed, added to the sylvan surroundings, are more typical of England than of Arabia, except that the vegetation is tropical and the birds strange. An hour and a quarter along this forest path brought us to an opening in the wadi bed where a large and fragrant pool nestled beneath a small beetling cliff from which giant creepers depended. Under the cliff was a small cavern whence issued the gushing lukewarm spring. Tiny fish abounded in the pool which also attracted various dragonflies and butterflies. Turning to the left we climbed more steeply than before, the trees growing thicker so as to compel dismounting, and at 4.30 we turned off into a grassy clearing and halted for the night at a place called Naqa'. We struck camp on the following morning, and leaving Naqa' continued to climb the thickly wooded wadi bed. The feature of its slopes is their cavernous appearance. Large rock caves fronted with stalactites and stalagmites suggestive of monsters' jaws were now high above, now on the level of the wadi bed. Trusses of straw or thorn thatch edging the accessible ones were marks of human habitation, for these are the "houses" of Al Kathir tribesmen. Camels, by the breeding of which these people live, we had passed in great number foraging in the woods as we came along; they are bred for their milk, the chief food of the tribesmen, and to transport frankincense, the chief product of the country, to the coasts.

A few miles farther on, where my aneroid read 1000 feet, we dismounted to climb out of the Wadi Gurzaz on its left bank by means of the pass of Hazal. A little over an hour's climb, the wooded slopes thinning as we went, brought us to rolling meadow country at 1650 feet. Zuftair was its name, where there was an Al Kathir settlement. The houses are very primitive, consisting of a tunnel-shaped straw thatch suggestive at a distance of small hayricks, and usually placed against the side of a cliff where they conceal the entrance to cave dwellings. Mistau was a collection of such as these, though the caves were said to have been artificial in contrast to the normal natural ones passed below. The lisped sibilant of this village name is characteristic of the speech and general nomenclature of Central South Arabia. I have elsewhere observed that from longitude 51° 10′ to longitude 56° 20′ is the habitat, the exclusive habitat except for Al Kathir elements, of a *bloc* of tribes non-Arabic in speech and dress, customs and physical appearance, and who are of great local antiquity—Ahl al Hadara.*

The Wadi Gurzaz is the eastern limit of Al Kathir elements of the Qara mountains, their habitat stretching westwards to Thifa near Risut. This constitutes a small Kathiri wedge in the Qara mountains otherwise held exclusively by the Qara tribe and their Shahara liegemen. They have two other kindred sections, Bait Kathir, a nomadic tribe of the steppe to the northwards, and Ar Rashid and Bait Imani elements of the distant sands. The whole, numbering

*These tribes consist of the Mahra, Qara, Bautahara, Shahara, Harasis, Afar, Barahama, Bil Haf, and Bit Istait (Bait ash Shaikh). The map names I have used for my route traverse map, strange as many of them are, are the arabicized versions given me by Bait Kathir tribesmen. I have however shown in Appendix A a short list illustrative of the Al Hadara variants in common use amongst the great majority of the inhabitants.

eight hundred men, recognize a common ancestor Kathir. Their numerical inferiority as compared with the Qara does not weigh in local politics. The Dhufar elements are said to represent only one-third of the Al Kathir tribe, the remainder living in Hadhramaut whence the locals claim to have come in comparatively recent times. It is doubtful if this origin is entirely true of Al Kathir mountain elements of Dhufar in view of their complete assimilation of the Shahara culture, for they are readily distinguishable from their nomad brethren. These latter, the Bait Kathir and Ar Rashid and Bait Imani sections, provided twenty-five of my escort, the other three being *rabi's*, two Daru' from Oman and a Karbi from Hadhramaut. The Bait Kathir speech is a dialect of Arabic, and their dress the normal Badu dress of Oman except that the *dish-dasheh* is worn short to the knees as is universal throughout South Arabia, and the poorer of them go stripped to the buff.

From Mistau, Shaikh Hamad, the spokesmen for the local-settled Al Kathir elements, and I pressed forward on foot through rolling meadow country where herds of cows and goats plentifully grazed, and halted near another small village, perched on the top of the hill, to take bearings on the seaports 2600 feet below while we waited for our camels. Mounting again we proceeded through Al Qatan, the meadow roof of the Qara mountains which constitutes the divide, and halted for the night on our second day out in Bu Matahan. This point marked the limit of previous European penetration. It was reached by the Bents in 1895. The height at Bu Matahan was 3070 feet, the temperature fell to 45°, which was bitterly cold after the accustomed 70° of the Salala nights. The Badus' unwillingness to make an early start enabled me to shoot a hawk. This my companions looked on suspiciously while we carefully examined it, for its flesh is not lawful, and my secretary gave it a cotton wad of formalin against skinning operations after the day's march. 'Ali had acquired training at the Bombay Natural History Society, and came armed with skinning instruments and preservatives. This, my sporting gun, cranial callipers and a 16-mm. kinematograph camera were the only additions to the normal instruments I carried on earlier journeys, namely prismatic compass, aneroids, hydrometer, sextant, artificial horizon, chronometers and still camera.

At 10.40 a.m. on January 13 we made a belated start, our immediate destination being Aiyun, a well-known water-hole belonging to Bait Kathir in the upper course of Wadi Ghudun. Within half an hour my aneroid started to fall, and then, turning out of the hills to the west, there spread out before and below us a vast panorama of red rolling country, its colour and treelessness in pointed contrast to that of the hills and their wooded meadow behind. In reality in its hidden and otherwise desolate wadi beds that were immediately before us flourishes the *mughur* or frankincense tree. Of this we soon had token when two ragged Kathiri tribesmen passed us with camels laden with the fragrant gum bound for a coastal port. My dismounted Badus exchanged customary nose kisses with their kinsmen, but the latter saluted my Daru' Badus, as befits the stranger, with outstretched arm and a smart tap of the finger-tips only. This point marks the northward limit of the settled tribes of the mountains, namely the Qara, Al Kathir and Shahara; it also marks a geological division. Before us was a great uninhabited wilderness of sandstone steppe sloping down a six-days' march to the sands. A region of great aridity, only the occasional wadi

bed constitutes an artery of scant vegetation and hence a pathway to penetration. Behind us was the limestone system, Upper Cretaceous to Eocene, of the Dhufar province. The topographical structure of the region was thus: (*a*) *Jurbaib*, a maritime coastal plain; (*b*) *Khutim*, seaward mountain slopes cloven by deep and wooded wadi rifts and spanned by stony meadows; (*c*) *Qatan*, the divide averaging 3000 feet; (*d*) *Nejd*, the sandstone steppe. These four belts stretching east and west thus succeeded each other from south to north. A word-list of their respective flora is given in Appendix E. Our descent from the Qatan to the Nejd was by a gentle spur of hill running westerly. The wadi bed left behind on our left hand was the source of Gurzaz, the seaward wadi by which we had come. To our right front the wadi beds now ran in the opposite direction. A low dividing ridge, here by name Mutushf (Umm Tushf ?), was speckled white with salt efflorescence. We descended at noon to cross a spacious but desolate wadi head of Ghudun, the great dry wadi, by which we were to make our way northwards, and crossed another an hour later to halt just beyond. Here short of Aiyun were some ancient trilith monuments of a kind I had met on a previous journey, but here they were without inscriptions. I had great trouble to prevent my Badus from halting for the day over the water The aneroid fell to 2500 feet as our way onward led at first through tiny shallow winding upper courses of Wadi Haluf, a large tributary of Ghudun and utterly desolate but for occasional frankincense. Thence we crossed a flat red plain in a north-westerly direction moving down into more broken country where suddenly a deep gorge opened out some 200 feet beneath us. This was another affluent of Wadi Haluf, the Wadi Dhuhair, where our objective was the water-hole of Shuwairima. Six distant grazing camels denoted man's presence. A figure of a man was seen leaping to a rock and my companions expected him to open defensive rifle fire. From our side a waved *musur* and shouted reassurances led to his emergence, and we descended steeply into the great white pebbly floor beneath. Our fugitive turned out to be a Mahri tribesman whose wife and two emaciated children occupied a neighbouring cave: the last human life we were to meet till our return to these latitudes a month later.

The frankincense country was now behind us. That this is the famous frankincense region, par excellence, of ancient Arabia there can be little doubt. If the Hadhramaut and Yemen possessed orchards they have long since dwindled to proportions so incomparably poorer than those of the Dhufar hinterland as to have allowed their memory to fade from the tribal mind. Here the original possessors of the land, the Shahara (Saro), still represent a considerable element of the population, albeit a depressed one, for their ancient inheritance is now possessed largely by the Qara and mountain Al Kathir, who, with it, apparently have absorbed their culture. Their ancient position is unanimously accorded them by their dispossessors, and the regional names by which the province is known to this day are the names of the seven traditional ancestors of the Shahara. They gave to the land their own names: Qara, Faiyit, Khati, Ghadhab, Hunguli, 'Ain az Zughul.

The frankincense tree grows wild: it is not planted. Orchards are of two sizes: (1) a *manzila*, of which the most famous are Afaur, Asug, Afar, Gizilaut, Zuwa, Ata Tanshit, Qaim and Amaut; (2) a *hawil* of a size that can be worked by five collectors or fewer. The tree grows best in the upland ultramontane

Trilith monument near Aiyun, Wadi Ghudun

The waterhole of Shisur

The foothills of the Nejd, Wadi Hila

Looking towards Wadi al 'Arʿadh from the top of the great Mursaudid sand dune

The Wadi Mugshin

The pool of Al 'Ain

slopes of the Nejd between altitudes 2250 feet and 2500 feet. This area is on the edge of the summer rain belt—cismontane Dhufar is unique throughout South Arabia, and must have been so in early historical times, for its prolific rains (the Indian South-West Monsoons)—from which the *mughur* derives a moisture-laden atmosphere. The young tree becomes bearing from the third to the fourth year. The process is for the bark of the lower branches a foot or two from the ground (there is scarcely a central trunk) to be chipped superficially here and there with a special knife, and then left for ten days. The gum exudes at these spots and hardens in large lozenge-shaped tears which are then scraped off and collected. The tree continues to yield from these old incisions at intervals of ten days for a period of five months, the incisions being deepened afresh now and again as may be necessary. After this the tree dries up and is left to recover, the period varying from six months to two years according to its condition. Collection of the *liban* goes on chiefly during the summer months. It is stored in the mountain caves till the winter, when it is sent down to the ports for export to India, the Indian Ocean being unnavigable for country craft during the gales of the summer south-west monsoon. This delay enables the product to dry well, though normally it is ready for export in from ten to twenty days after collection.

There are three varieties of frankincense: *negedi* (*nejdi*), *shazari* and *sha'abi*, their quality descending in the same order. *Negedi*, the silver variety, is the product of the intramontane uplands of the Samhan and Qara mountains: *shazari* is the product of the mountain region of that name at the junction of the Qamar and Qara ranges; and *sha'abi* is a poor quality of the plain around Risut. The frankincense ports from west to east are Jadhib, Rakhyut, Risut, 'Auqad, Salala, Hafa, Taqa, Murbat, Sudh and Hadhabaram.

But to return to my narrative. In Wadi Dhuhair the night temperature fell to 42° dry and 39° wet bulb, a very cold night, and the aneroid read 2250 feet at dawn. My suggestion of an early start elicited applause from my Badus, who however in reality meant nothing of the kind. Their love of dallying over a waterhole, especially if the next one be remote, and Shisur was six days ahead, was an incurable condition of mind which I was to resign myself to in the coming weeks. Hours were spent filling their skins and watering their camels, and it was not before 10.5 a.m. that we made a start. The rough pebbly wadi bed was enclosed on both sides by lofty red slopes which, shrinking as we proceeded on our northerly course, had dwindled to 40 or 50 feet in 6 miles. Here Wadi Dhuhair turned eastwards to join Wadi Haluf of spacious dimensions and now conspicuous by a glistening white pagoda-like hillock in its mid course, Al Burj by name.

The Haluf, bordered here by characteristic light-coloured hills of pyramidal and conical shapes, now became winding, and in order to shorten distances we cut across the plain (*Sih*). Thus for upwards of two hours after our short midday halt we had proceeded on a north-north-west course when, turning more towards the declining sun, we entered the spacious Wadi Haluf again, a delightful halting place. It is here a great white ribbon of *masila* with plentiful vegetation. *Samr* acacia was the dominant form and considerable palmy *ghadaf* from which the Badu makes his rope and sacking, a task to which the night watch addressed themselves. A very heavy dew fell, the dry and wet bulb

registering 51° and 50° respectively, and provided an explanation for the comparatively plentiful flora and fauna. For we soon started a posse of gazelle, and throughout the day gazelle tracks in the sand were numerous. There were those of the wolf and hyena too, and, more ominous, the tracks of a *gom*—enemy raiders, fortunately old ones. We were now passing from the region of the hills "from whence cometh help" to the remoter plain exposed to the assaults of raiding parties. For this reason and the knowledge that vegetation would grow sparser in the six waterless days ahead we must be more and more on the *qui vive* and keep the caravan as close together as possible. Beyond Al Ghiyar in Wadi Haluf, a joyous camp for its pastures, we trekked towards the wadi into which it falls, the Ghudun, and made the junction three and a half hours later. The Ghudun is "the" wadi of Al Kathir: the "Mother of Wadis," a Bait Kathir Shaikh of my escort had called it; but it was a parched and pallid spot where we entered it and continued so, which made the remark ludicrous and recalled the Arab proverb, "One's own ass is preferable to the horse of another." The camp was an hour ahead. The pack animals straggled in without headropes as usual, and if they did not follow their Badu owners with dog-like devotion it would be a poor look out for one's instruments. A pack saddle, to say nothing of a headrope, is superfluous to tribal folk accustomed only to carrying sacks of frankincense, and their substitute was a bag of straw strapped over the hump. Packs are tethered to this with the slightest home-made ropes, and depend for stability on being properly balanced on both sides. Our problem was not simplified by the necessity of overloading, for four baggage camels arranged for had failed to turn up.

We made an early morning start on January 15 from Al Khurba, and leaving the Wadi Ghudun on the right bank struck across the desolate plain on a northerly course. Gently undulating at first, it soon becomes hummocky and the high ground is covered with frequent patches of a small cinder-like stone, and occasionally red sandstone outcrops occur laminated in slaty formation. Yesterday we had seen tracks of wolf, gazelle, and hare and the first footmarks of an antelope in the sandy plain: to-day there were numerous traces of antelope, and soon after midday when we were once more in the wadi bed we put one up. It lumbered up a side wadi pursued by a stalking Badu, who returned unsuccessful. Thence we proceeded through a barren land. According to the Badus the slight winter rains which at one time are said to have fallen in the Nejd no longer do so. "The sword of God has been upon the *dira* for fourteen years," said one, an allusion to drought. This was the same story I had heard in all parts of South-East Arabia (including Oman). During the past two decades even the scant rain that was has been abnormally low or ceased altogether. Whether increasing desiccation is a permanent phase cannot be asserted, as this year's winter rains have been abnormally good.

We shot our first antelope the next morning (January 16) at the junction of Wadi Ghara with Ghudun, a full-sized cow. While I was zealous for her skin, the Badus were scarcely less solicitous for the paunch, the gastric juices of which they carefully drained and drank with great relish. The solid contents were then administered in handfuls to their bellowing protesting camels. The benefit to the respective insides of man and mount is said to be equalled by nothing else in the desert. These are but two of the seven virtues the Badus

ascribe to the antelope. Its flesh they rate higher than that of any other beast (I could not subscribe to the same view): a judgment I suspect based upon a comparison of the after effects of eating meat gluttonously on an empty stomach, for moderation in their normally frugal diet is unknown, and my medicine chest was always in requisition after a night orgy following a "kill." To-day saw the last of the *samr* acacia and the first meeting with the willowy tamarisk, though the predominant vegetation on which the camel depends is, in these middle altitudes, *hardhai*, the *salam* of the Arab poets. Here was Dhimir Ghurbadh which marked the turn of the zigzag, the course Wadi Ghudun takes from the mountains to where it falls into a trunk wadi, Umm al Hait.

Up till to-day our course had been in a general north-westerly direction. Henceforward it was to veer to the north-east. The pebbly wadi bed which had run between steep rifts in the early stages had now become less pebbly and more sandy; the containing slopes had shrunk to mere banks and the vegetation had grown scantier and less hardy through the gradually falling altitudes, while ahead its prospect was a shallow depression marked by withered scrub in the wide featureless sandy plain. Now and then the wadi bed branched to embrace a shallow island of sandstone, poor landmarks that enjoy a distinguishing name. Of such were Nafit and Nawafit. A few small lizards and odd butterflies and locusts were all that this area yielded, birds were non-existent except for an occasional sand-coloured lark (?), and my gun was idle. We left the wadi bed of Ghudun at 1.15 p.m., where a perforated rock is named the Radna, and took a north-north-east course across a black flint-strewn plain sunbaked and steamy with mirages. Shisur was our immediate objective, the nearest waterhole to the great sands, and the first waterhole since leaving Shuwairima, six days behind us. A halt short of Shisur or beyond it was necessary for our camels, as the neighbourhood was innocent of pasture.

Approach to a waterhole is carried out with much caution. If an enemy is already in possession there is the choice of a hasty retreat tormented by thirst and fear of pursuit, or their realities, and a fight for possession. My Badus had all of them suffered in Ghudun at the hands of the Sa'ar and Nahad tribes of the Hadhramaut (and had all raided those tribes in their own western marches), to say nothing of Murra and 'Awamir depredations. And now there was a careful scrutinizing of the ground for possible recent tracks of a *gom*. None was visible —a desirable state of affairs, seeing that we had arrived with our water-skins completely exhausted. We halted overnight at a wretched camp, Mutugtaig, a few miles short of the waterhole, where two large and different edible lizards and a 3-foot snake were killed. Thither a small advance party of three men had proceeded to spy out the land and dig out the waterhole preparatory to to-morrow's watering. It is a common practice in the desert to fill in a waterhole when you leave it, a course that will delay a possible pursuer obliged first to redig it himself. But here nature did it for you, for the spring of Shisur lies in the cleft of a deep cave some 50 feet below the surface of the plain, and left for some time fills itself up with denuding sand.

Sunday the 19th was a fateful day. We had arrived within a day's march of the great sands that lay to the north, but my escort had made it clear to me coming along that they were against any foolhardy enterprises into the sands,

and now openly avowed that Shisur was the limit alike imposed by their undertakings and justified by prudence. A section of them was prepared to take a four-days' water supply at Shisur and make a gentle sortie with me into the sands in the same longitude and so back again. More, they asserted, was impossible. I had cherished a plan of reaching the central sands of Ramlat Hibak, reported to be ten-days' march north of Shisur, but the idea was scorned. First there were no waterholes in the sands as approached from this angle; second, only the Ar Rashid elements had been into the heart of Ar Rimal; and thirdly, most of their camels were utterly unfitted for the sands: could not in fact traverse them. I was to discover that at least the third argument was a genuine one. The camel born and bred in the mountains is as useless in the soft sands as a rudderless ship in the ocean; it moreover quickly loses condition as a result of a radical change of diet. Four of my baggage camels of this description had already found the present journey beyond their powers and were fast breaking up. A change of plan was necessary, and I hit upon the idea of a journey along the fringe of the sands for 100 miles to explore the wadi system of Umm al Hait running north-eastward from Shisur to a reported oasis of Mugshin, and thence (this a mental reservation) to make a dive into the sands from that point. The suggestion created a storm of opposition on the score of the inability of our camels to cover another six-days' trek wholly innocent of a waterhole, and also that Ramadhan was approaching, when Muslimin should fast in the bosom of their families. The day passed in an atmosphere of tension, but by judicious presents the three most influential of the men came over to my side, and through their medium the remainder followed. My scheme involved a general cut of doubtful animals; hence I was obliged to dismiss six of my Ar Rashid and Bait Imani escort, and return four of my already insufficient baggage animals to Dhufar.

This meant cutting down my baggage and involved my tent, all but the indispensable part of my food stores, a special Natural History box, and most of my medicine case. The departing camels having returned from their final watering we bid them adieu, and mounting our own struck due east across the plain to Shisur. A marvellously flat and stoneless *jadda* enclosed by sandstone ridges was succeeded by another, and beyond it rose a square sandstone rock crowned by the rude ruins of an old fort. This was Shisur. A deep natural hole in rough semi-circular form undercutting the hill led to a fissure in its base which barely admitted a human arm to pass into it to the water beneath. I collected a specimen of the rank-smelling water and with great care brought it to Muscat where it was thrown away by an unwitting servant. One Badr bin Tuwairij was the legendary builder of the fort of Shisur in some dim past, and my Badus averred that in the immediately surrounding plain are still faint traces of dark furrows as though it once had known the plough. Beyond in the naked plain below was the pleasant tiny copse of Hailat ash Shisur, and here we halted for the night. The altitude was 1120 feet, and my thermometer, now and henceforward exposed to the night as I had lost my tent, recorded 55° in the small hours. Following a late start our course was at first north-westwards to avoid a low ridge and thence on a bearing of N. 20° across the flat sandy plain. Two flanking ridges, Bir Nifis and Al Usbu', the latter appropriately fronted by a finger-shaped rock, obscured the wadi bed of the Ghudun, which we shortly

afterwards reached, a shallow depression, sandy and now almost devoid of pebbles, where bushes of sage-coloured *ashera* (Oman *ashkhara*) were met for the first time. Altitude 1000 feet. From this point the southern ridges of the great sands now rose above the northern skyline. To me the sight was a spur, while my unconcerned escort dallied behind over some tamarisk and delayed a mile in the rear. It was not till the late afternoon that my companions caught me up, and I was for halting for the night from tiredness, but they insisted that the camel fodder was insufficient and we must go on. The traveller in the great desert soon discovers that the welfare of the camel is the Badu's supreme consideration. Starts and halts are normally determined by the quality of the grazing. Fodder is almost more important than water, for the camel can carry a load for a week and more without water, but food is a daily want. The European accustomed to a programme, a time to start, a time to halt, a time to eat and an expectation of a certain average daily mileage, will get a rude shock. The son of these barren marches subordinates everything, yourself included, to the efficiency of his transport—the health of his camel. Be camped over good pasture with water at hand and he will not leave it; come upon a few verdant bushes during the noonday and though the hot sun is striking down on your back he will dally there for an hour; arrive at sunset after a gruelling day in the saddle and if the pasture does not please him he will insist on riding on, indifferent to your fatigue. And so to-day it was two hours after sunset before we made a halt. This was near the junction of Wadi Ghudun with Umm al Hait. A blinding sandstorm had sprung up at sunset and grew with increasing fury, filling one's eyes and ears and making eating out of doors unpleasant in the extreme. Oddly enough it blew not from the sands but towards them, and thereby appears to show that the formation of southern Ar Rimal, at least regionally, is the blown sands from the disintegrating surface of the steppe. The specimens I brought back from the sands may decide whether this is so or not.

An early start was made as daylight revealed the camel-thorn to be poor. We were as usual preceded by three of the more sporting Badus, encouraged by mammon to shoot for the museum. This was no man's land. The Ghudun valley to Shisur had been Bait Kathir habitat, but here beyond it any one met must be regarded as of doubtful intention and a potential enemy. My Badus spent their time scanning the horizons for movement—their detection of gazelle and antelope at great distances was extraordinary—and scrutinizing the sands for camel tracks of enemy raiders. I was interested to hear the details of a raid that had exercised me two years before when I journeyed through the South-Eastern borderlands, and which exemplifies the precarious life of the desert. Within a fortnight of my arriving at Andhaur in 1928 (see *G.J.*, 73, 1929, pp. 143–215) a party of twenty-five raiders of the Sa'ar and Karab, whose habitat lies to the north-west of Hadhramaut, had raided a party of Mahra close to the waterhole I had arrived at and carried off forty of their camels—an occasion that decided my dozen Badus to dispense with our usual camp fire. Now I was to learn that on the return of this raiding party they were intercepted at night time by another raiding party consisting of thirty-five of the Mahra and five Kathiris, the collision occurring at Hailat ash Shisur, where the possession of the waterhole was of life-and-death importance. The

Ma'arab* raiders were despoiled of their booty and lost five of their own camels as well, so that many of their survivors escaped riding two to each camel. Within twenty-four hours another raiding party of twenty-five from the Ma'arab met a more numerous Bait Kathir party at Difin. There were seven killed including shaikhs of both sides, and twenty-five camels changed hands. Members of my escort had been in both raids. Happily peace prevailed between the Sa'ar and Al Kathir tribes since that time, but the Nahad, the Karab, and the Abida still remained in a state of war with my Kathiri companions, who spent a large part of their time discussing the fears of being raided and the hopes of raiding. Hence also the presence of the Karbi *rabi'* in my party.

For the next few days we were to have the undulating ridges of the great sands on our left hand and the flat sweeping step of the Nejd on our right, following the north-easterly line of the trunk wadi which roughly divides them. A geological feature of some interest was the presence in great numbers of a curious whitish ball-shaped fossil, porous and pumice-like, found everywhere on the sandy surface. We dismounted for three midday hours where there was good grazing: a halt I welcomed as the sun was hot and my Badus had during the morning brought in two sand hedgehogs, which the opportunity would afford us to skin, and a large black scorpion. The latter in spite of its sting was toyed with by them with their naked hands. The hedgehogs with their pig-like snouts and spiky bodies were set down and burrowed vainly to escape. They were interesting specimens of a sand colour in contrast to the black and larger hedgehogs of Oman. They are said to attack and eat snakes, but go in craven fear of the vulture (*rukhum*), on the approach of which they weakly unwind themselves and shedding their protection become ready victims. Restarting, we passed the point where a large wadi, Dauka by name and only slightly inferior in proportions to Wadi Ghudun, joined Umm al Hait from the south, the aneroid registering 960 feet. Continuing on a north-easterly course a halt an hour before sunset was occasioned by the shooting of an antelope. The horns provided me with two flutes, the only musical instruments known to the young tribal girls of South Arabia, who play them on the joyous occasions of marriage and circumcision. Seen in profile the long straight horns of the antelope appear to be one, and it is this animal that appears to have given rise to the myth of the unicorn.

A sandstorm made the night extremely uncomfortable. It grew to a hurricane against which we had only the *markh* bushes and the heaped banks collected about their roots as protection, and the use of thermometer or sextant was out of the question. Forked lightning lit up the night and the day dawned to the accompaniment of low rumbling thunder. Into the saddle at 6.35 a.m., our course now lay more easterly, taking us on a diagonal line out of the wadi on the south side where three conspicuous bluffs, Al Qurun, mark the beginning of

*Ma'arab and Mishgas are used in South Arabia as regional terms for westwards and eastwards of Dhufar respectively. The term Ahl al Ma'arab thus stands for the tribes Sa'ar, Karab, Nahad, 'Awamir, Manahil, etc., Ahl al Mishgas the Janaba, Yal Wahiba and Bani Bu 'Ali. The Harasis use this word Mishgas to mean Oman, which would suggest that the definition is an arbitrary one and the words have also a directional significance.

the district of Bin Gurdan. We shortly resumed our north-westerly course now in the sandy steppe. The wadi, marked only by low scrub, for it is henceforth on the level with the plain below the skirting ridge of the sands, is here veering northwards and slightly receding. At this point a sand dune called Musairif marks the point where the name of the Wadi Umm al Hait ceases to apply in favour of Al 'Aradh, so named because of its subsequent tortuousness.

My companions, human and animal, scented water, and there was considerable commotion, for rain to the Badu is as gold to the prospector. Splitting up into three parties and spreading ourselves to move off fanwise we scouted the plain for rain pools. Our last watering was four days behind and our water was getting low and tainted from the daily churning of the march in sheep-skins as usual insufficiently cured. A distant rifle shot was the signal of discovery, and the party I was with wheeled about and proceeded in that direction, when topping a rise we came upon our companions revelling in some scant water collected in patch surface depressions—*sifasif* they were called.

The watering here produced the largest type of edible lizard known to these parts. We halted in a *masila* of another wadi bed, Bin Khautar, shortly afterwards, the ride being unpleasant from a sand-saturated atmosphere and heavy lowering clouds, which later made astronomical observations impossible. The following morning, January 25, was extremely cold, and we proceeded north-eastwards with a strong wind in our faces. The sun was obscured by thick sand clouds and photography made impossible from a sand-acquiring lens. A tentative attempt to make a picture had encouraged the Badus to halt at a *hariyat* (copse) just ahead, where shivering they huddled themselves around camp fires, and they could only be got to move on after heated words. Turning more northerly we moved on through Bin Khautar. The storm veered round at sunset to blow strongly from the south, and changed back once more in the morning to face us as we proceeded on a north-north-easterly course. An hour's uncomfortable ride through a sheet of sand that skimmed across the plain like a veil of smoke brought us in at last to a high sand dune on our left hand. This was Mahtirgat. Scarcely less conspicuous after days of the arid steppe and sand was a considerable stretch of large *ghaf* acacias running from the south-south-east to break here into several deltaic channels. This was the head of the Wadi Katibit, perhaps the most considerable wadi of this system, where it falls into Al 'Aradh. Here we turned due north and entered a field of fair-size rolling sand dunes of a very soft and yielding sand. Many of our unaccustomed animals floundered about tiringly up to their shanks, if indeed they did not stand petrified at the edge of a steep decline and refuse to budge unless we dismounted and led them; and this in sorry contrast to the light and care-free camel of my Rashidi companion bred in the sands and which seemed to skid lightly over the surface. Thus a cold and unpleasant ride through the Ramlat Umm al Hanash. Suddenly the going improved, and for the first time during the last ten days of a journey down the imperceptibly sloping steppe, a slight descent could be detected. Before us an unending procession of giant *ghaf* trees, the famous Wadi Mugshin, suddenly presented itself. Beyond them an ocean of reddish sand, Ar Rimal. Astride them two great sand dunes, Birsa and Mursaudid, standing as though a gateway to the mysterious ocean, like the Pillars of Hercules.

Before continuing the narrative of my journey it is convenient here to consider (*a*) the entire wadi system of Umm al Hait by means of a part of which I had made my way thus far, and (*b*) the intramontane country west of it to the limits of Western Hadhramaut; in brief to review the southern borderlands of the great sands, and the tribes that occupy them.

Reference to the map of South Arabia will show between longitudes 51° 40′ and 54° 40′ four mountain ranges by name Fatk-Shaghuwaut, Jabal Qamar, Jabal Qara, and Jabal Samhan, constituting a continuous coastal chain. Except for my journey in 1928, when my march from Ja'alan lay skirting the Samhan series on its north side, no European had peered into what was beyond them. My recent journey, which is the subject of this paper, discovered a large single dry wadi system draining these four ranges inland through a vast sandstone steppe declining from south to north and from west to east.

This system consists of six main tributary wadis running in more or less parallel courses northwards from the coastal range to the verge of the sands where they join a trunk wadi. The trunk wadi marches with the sands in a general north-easterly direction to a point where it turns and is lost in them in latitude 19° 35′, longitude 54° 50′, a point marked by the bountiful oasis of Mugshin. The six wadis all rise in the neighbourhood of the divide, averaging 3000 feet at a three-days' march from the coast. From east to west they are called Katibit, Dauka, Ghudun, Aidam, Shihin and Hat, and their lengths, diminishing, broadly speaking, in the same order, vary between an eight-days' march in Katibit and a four-days' march in Hat. The main trunk wadi has five sectional names, Hat, Shihin, Umm al Hait, Al 'Aradh and Mugshin, in its course from south-west to north-east, but the whole system may conveniently be termed by the generic name Umm al Hait (mother of life), which name has also the sectional connotation referred to.

The tributary wadis are systems in themselves. Thus Wadi Katibit has affluents Andhaur, Dhahibun, Ingudan, Ghazal and Rakibit draining the eastern part of the Qara mountains and the western part of Samhan. The eastern limit of the system is Andhaur, which rises approximately north of Murbat Peak, whose alternative name shown on the chart as Jabal Du'an is unknown to the inhabitants, who call it Zairutun. Wadi Dauka rises north of Salala and receives Al Hauf, Dha'arfit and Ista. Wadi Ghudun rises slightly to the west of Dauka and receives Hila, Dhuhair, and Haluf on its right bank and Ghara on its left. Wadi Aidam rises in the longitude of Rakhyut and with its two large tributaries Difin and Habarut, rising respectively north of Jadhib and Damkut, drains the whole of the Qamar range. Wadi Shihin and Wadi Hat are shorter systems rising at the respective eastern and western extremities of Fatk-Shaghuwaut.

To the northward and westward of the trunk wadi the sands stretch continuously northward to the Persian Gulf and continuously westward to the confines of Dawasir and Najran. Actually the southern edge of the sands overlaps the trunk wadi in Mugshin and Al 'Aradh, hugs it in Umm al Hait, and falls away to a day's march north of Shihin and two days north of Hat. Thence it trends west-south-west towards the Hadhramaut, where only a day's march separates the mountains from the sands. The intramontane steppe of the southern borderlands is therefore wedge-shaped, narrowing westerly, and

A son of the Sands: Sahail the Rashidi

The ridged dunes of Ramlat al Mugshin

A halt in the sands of Ramlat al Mugshin

The spring of Al 'Ain

A Bait Imani

The waterhole of Hanun, Wadi Ghabartan

according to my companions, who habitually move in its wastes, slopes upwards in that direction also: this is supported by my diminishing aneroid readings moving east from Shisur.

It is crossed by individual parallel wadis running north to disappear at the edge of the sands. The most important of these proceeding westerly from Hat are Sha'ait, Arkhaut, Urba, Dhahiya, Rama, Aiwat al Manahil, Jinab, Hardha, Khadhra, Hizar and Aiwat as Sa'ar. There are only very occasional waterholes, namely Sinau in W. Dhahiya, Thamut in W. Jinab, Shagham in W. Hizar and Minwukh in W. Aiwat as Sa'ar, and the route of raiders east and west is thus precariously circumscribed. In the mountain sources of the wadis there is occasional running water, *e.g.* Andhaur and Habarut. But the lower courses of these, of which Ghudun has been an example, are all cruelly dry. They follow a uniform formation. Steep and narrow gorges with pebble beds form their sources; thence they grow wider and shallower and sandy as they run north until they lose their trough character in the plain approaching the sands, where their courses are perceptible by a line of parched scrub. The scene is one of great aridity and desolation. As the wadis shorten in the western Nejd so are they said to gain in spaciousness, and Rama (Arma), one of the mightiest of them, is held to be thrice greater than Andhaur.

This great steppe of the Southern Desert is thus capable of supporting only a precarious pastoral existence of nomad Badawin. In summer the great aridity drives them back into the mountain courses around the perennial waterholes —Andhaur, Hanun, Shuwairima, Aiyun and Habarut (these in Umm al Hait longitudes). But immediately following rains they sally down again, and in winter they may remain for a month or two in favoured localities, their movements often being guided by their pillar of fire, the direction of lightning. It is a hungry and thirsty life and many of them are drawn back to the settled comfort of the frankincense orchard, especially during the summer, when its comparatively rich rewards are the means of acquiring rifle, ammunition, clothes, coffee, and occasional rice. But the true Badu despises any but his spartan existence. He lives mainly on camels' milk and holds life cheap. Raiding to these tribes is the spice of life. There was scarcely a man of my escort who had not raided into the Hadhramaut hinterland and been raided; it was the main topic of conversation, and some bore honourable marks thereof. Arms and ammunition and the health of his camel are thus the primary considerations of this Badu existence, where hereditary blood feuds divide the tribes, might is right, and man ever walks in fear for his life and possessions.

The tribes of importance occupying these southern borderlands are, from east to west, Bait Kathir, Mahra, Manahil, 'Awamir, Sa'ar, Nahad, and Karab. The Mahra are the most numerous (they have *hadhr* and sailors amongst them), numbering many thousands; the Nahad and Karab, the smallest tribes, numbering but a hundred or two respectively. Tribal distribution is as follows: The Umm al Hait system is the habitat mainly of two tribes, Mahra and Bait Kathir; they also extend to the west. Nominally the lower wadi reaches of Dauka, Ghudun, Aidam and Hat belong to Bait Kathir, though there is no let or hindrance to the Mahra using them. The upper sources of the wadis (except Ghudun) are largely in Mahra hands, particularly Habarut, Ghazal, Ingudan and Dhahibun, as well as the individual wadis immediately

to the west. Scattered about amidst the Mahra and Bait Kathir are a number of small Hadara tribes, non-Arab remainders. Thus to the westward of Hat in its lower courses is found the Balhaf, a rather nondescript tribe owing allegiance to no faction, but Mahri in speech. A distinguishing feature of their dress is that they carry a knife, not a dagger, in their belts. They neither raid nor are raided and, like the Salub of Nejd, are accepted as a *rabi'* by all. They are also the servants of the shrine of Jauhari (Umm at Tabbakh), where the Mahra pay pilgrimages and make sacrifices. At the other extremity of the Umm al Hait system, Wadi Andhaur is nominally a possession of the Bautahara (Bit Bohor), though Al Mahra are the tribal element generally in evidence there. The Bautahara, a now dwindling and declassé tribe with an exclusive language, were once the reputed possessors of the whole eastern steppe from W. Ghudun to W. Qadan (Ghudun?), while the western steppe is reputed to have belonged to the now legendary Bin Dhurbut. Another small tribe is the 'Afar, a part of whom live in Habarut with Al Mahra. Their language is a variant of Mahri, called 'Aforit, and is the same as that spoken by the Harasis. Still another obscure tribe is the Bait ash Shaikh (Insakht or sometimes Bit Istait) of Shahari tongue occupying Wadi Ingudan and the waterhole of Hanun. Bait ash Shaikh are thought to be collateral with the Shahara and once to have co-inhabited the great port, now a heap of ancient ruins, of Ar Rubat (Ariyot). Thus throughout the whole area the only tribe whose mother tongue is Arabic is Bait Kathir. Coincidently too it is the one tribe claiming to be Hinawi in origin.

I have elsewhere observed that these political labels of Oman, Hinawi and Ghafari, hold throughout the South Arabian steppe, where however they stand for Qahtani and Nizari respectively, or perhaps in the case of Ghafari for everything non-Hinawi. To the westwards the Wadi Rama is the dividing line between the Mahra and Manahil (the latter now Hinawi but in origin Ghafari). The Manahil habitat stretches westwards to Wadi al Jauf, whence starts the 'Awamir tribe (Ghafari). The 'Awamir occupy the wadis westward to Wadi Khadhra, whence begins the Sa'ar tribe (Ghafari). I was anxious to discover from my companions, and from the Mahris I met, information concerning Bir Burhut, the supposed scene of volcanic activity, the only one on the mainland of Arabia, a place many of them knew well, and one that Dr. Hogarth speaks of as "that great well cursed by 'Ali according to the Jihan Numa." They all were emphatic that no volcano existed. But a variety of superstitions is attached to the wadi bed wherein the well exists. The most persistent was that it was the place of the departed spirits of wicked men, so that no mortal dares to approach it by night. As a variety of Hell, it may well be that its supposed volcanic activity has symbolical significance. The only archaeological remain of interest I saw to the north of the divide was the trilith monument already referred to, but none of them was inscribed with Ethiopic characters as were those I had met in Wadi Dhikur. A point of interest is that the tribes here refer to these monuments as Bit Aba Ghassan, which would appear to preserve the Ghassanitae of Ptolemy. There was of course a post-Islam Ghassanid dynasty of Dhufar, but the trilith monuments, judging from their pre-Arab inscriptions where inscribed, their non-Islamic orientation, and a universal local tradition, belong to the "Days of Ignorance."

The life of the steppe is primitive in the extreme. It has already been observed that drought and the fear of raiders drive these tribes back against their water in the mountains. But at heart they are wedded to their nomadic existence, and whenever rain comes they launch out with their flocks and herds into the desert, where every little rock shallow capable of holding rain water has a name and a memory. And here they remain for a space till once more drought threatens and hunger drives. There is not sufficient water to support the horse or the dog. Tents or houses are unknown. The shade of an acacia takes their place in the desert: the cave in the mountains. Men are wholly illiterate. Few know anything of the Quran, though they pray zealously. They have a great reverence for shrines and Shurafa, and are of the Shafi'i sect. The usual laws of polygamous marriage and facile divorce obtain, but it is rare for a Badu to have more than two wives at any one time. Large families of sons are desirable.

The South Arabians are inveterate smokers of the communal pipe, which usually consists of an empty ·303 cartridge case, the cap removed to permit "drawing." Each takes a few deep inhaled whiffs by which he intoxicates himself and passes it on to go the round of those present. Their jurisprudence, which has chiefly to do with the division of inheritances and marriage dowries, is, as general in Badawin Arabia, carried on by the "hukm al hauz." Petty theft is rare and immoral: not so the raid, when murder and looting are honourable acts. Serious offences require swearing on one of the revenging shrines, but for murder cases ordeal by fire is almost invariably resorted to. Bodily illness is dealt with by certain herbs (see Appendix E), by the hot branding iron, exorcism, the gastric juices of the animals slaughtered in the chase, and the urine of the young cow camel. An almost universal male custom among the Mahra and cognate tribes is to wear a single earring in the right ear; another affected by boys is the top-knot recalling the Horus lock. Broadly speaking, women may not milk camels or cows, but are permitted to milk sheep. They "beautify" themselves by smearing their faces and bodies with indigo.

The vegetation of the steppe naturally varies with latitude and altitude (see Appendix E). *Ghaf* acacia I found the characteristic flora of sandy soil in the low eastern altitudes about 500 feet, *samr* acacia the predominant form in stony soil in altitudes of 1200 feet and over. These are the two principal foods of the camel, with *hardhai* (salam) and *markh*, humbler bushes, coming next in importance, and flourishing in middle altitudes. These flora are unknown to the sands proper, where the camel must be content with *'abala*, *zahara*, *qasisa*, *birkana*, and the like.

The animals of the Southern Desert would appear to be non-drinking animals, or at least their habitat is almost rainless and the moisture contained in its herbage must be derived from dews. My specimens numbered 7 mammals, 36 reptiles, 15 birds and 64 insects (see Appendix F). Antelope, gazelle and hare are comparatively common in the middle and lower courses of the wadis running north to the sands, foxes less so. The *rim* or pure white gazelle is said to be almost extinct, though I picked up a pair of antlers, lyre-shaped and with a tuft of white hair still attaching to their base. The ostrich is extinct except in the far south-west, in the Sa'ar habitat where they were once plentiful, and specimens are still occasionally seen. Sand lizards exist in great variety, three large edible ones (all of which I got) and numerous smaller varieties chiefly on

the verge of the sands where also hedgehogs and sandrats are found. There are five varieties of snakes, of which I got three, and numerous scorpions, locusts, butterflies, beetles, and smaller sand insects. Birds are rare. The crow is the most persistent type from the mountains northwards, though he is only occasional. One specimen I got was pure black; another an abnormal specimen, its neck a ring of white feathers. I saw no vultures, which I was led to expect in the sands, anywhere except in the mountains, where they are plentiful. A black eagle was seen in a decaying condition on the verge of the sands Umm al Ha and a bustard near Mugshin.

To resume the narrative: January 27 was an intensely cold night at my camp in Wadi Mugshin between the two great dunes of Birsa and Mursaudid. I had not set up my thermometer from a mood induced by discovering that the chronometer I placed most reliance on during my journey had broken down, presumably as a result of the jolting it had received coming through the sand dunes. At dawn I climbed on foot to the top of Mursaudid to view the surrounding country and take bearings, but on arriving there my Arabs cautioned me to keep my head below the ridge lest a possible raiding party should spot us. The view was remarkable. Below us a green serpent of *ghaf* jungle lay across the circle of sand. In the far south-west Al 'Aradh, and here below us passing to the skyline due east Wadi Mugshin, a small branch also issuing at right angles to lose itself in the sands to the north. With its vast jungle of waving trees (the acreage cannot be less than 10,000) Mugshin must be the prince of *wadis* in South-East Arabia. To the north and west was a silent ocean of billowing sand. To the south a yellow plain with occasional sprawling sand dunes. Mursaudid was a half mile in length, 100 feet in its greatest height, and, like all the other dunes within sight, had an east and west axis. Mugshin and neighbourhood I was to find is to the Badu a jinn-infested spot. One of my Badus plucked a bunch of *abal* which grew on the lower slopes of Mursaudid to take along to his camel as Badus are wont to do, but his companion counselled him not to, on the score of some dark penalty. Here the camel that is fed by hand and does not forage for itself is doomed to die; and the mortal who destroys local life, a hare or gazelle for instance, will be pursued by bodily misfortune—whence my natural history collecting was to suffer.

We descended to our camp, and mounting moved off at 8.20 a.m. along an almost true easterly course. The eastern branch of Mugshin which we followed has a sand, not a pebble, bed and made heavy going. To avoid this we soon made for the edging plain in the direction of the low white cliff of Nugur, which we passed after two hours. We continued thus till 1.15, when we moved back into the wadi again, here a thick jungle of trees. Three only of my Badus had been to Mugshin within the last twenty years, and these moved on as an advance guard, ostensibly to discover if there were tracks of raiders about and to avoid surprise by a *gom* encamped over the waterhole. Our pace gradually slackened, and I, suspecting their intention of halting for the night, rode ahead. I was most anxious to make Al 'Ain, the spring that comes to the surface on the verge of the sands at the extremity of Mugshin, that day. Bearing in mind that our rations were being exhausted the effect of delaying tactics would be to cheat me of a final dive into the sands which was my objective. Badu conversations

showed my companions to have no stomach for the sands: "their camels would die." They had dismounted and I found myself 3 miles in advance and wondering if they would follow. The place had a reputation for blood, and a solitary rider in a thick jungle is not happier for reflecting on the possibility of a puff of smoke and a volley of rifle fire from close quarters. Happily four stalwarts had changed their minds and came trotting up. We skirted more northerly around the edge of the tree belt which must here be 2 miles broad, and at 3.15 came to its end. Before us was a wide sandy plain enclosed by a semi-circle of small detached trees and backed by the red rim of the great sands. It was approaching sunset when we entered the *ghaf* wadi ahead. Our main body in rear with food and bedding and instruments were nowhere in sight, and being thirsty it was doubtful whether they could manage the entire 30-mile march to-day. We now turned north through the thick undergrowth where we disturbed a hare and excited to protest a hidden wolf. Here before us in the twilight was a date grove—a wild date grove in Rub' al Khali. It grew not in the set order of the date groves of Oman or 'Iraq, but higgledy-piggledy along the banks of a marshy bed midst pools of stagnant water from the neighbouring waterhole. Its origin may be the date stones thrown there by some bygone raiding party. The fruit is said to be of a miserable kind as there is none at hand in spring to pollinate the budding fruit. The harvest belongs to any one making use of Mugshin in July or thereabouts, and is therefore not usually gathered, for Mugshin is a six-days' journey from the next nearest waterhole, a consideration which probably entails the harvester spending his whole summer there. My Rashidi companion dismounted and ran ahead to see that no enemy was over the water as we rode slowly forward.

On reaching Al 'Ain (also 'Ainain) I was much disappointed. Where was the running crystal stream I had been led to expect? The spring was a green shallow waterhole a yard or so in diameter in the palmery marked by swarming insects and a few dragonflies. At a few yards distant beyond some rushes was another waterhole which spread out into a shallow pond. The Badu, true to his camel, was watering it first, oblivious of the fouling for human use, and although thirsty in the extreme I was constrained to wait for coffee. Watering over, it was dark when we moved up into the *ghaf* to look for a clearing for to-night's camp after a tiring day of nine continuous hours in the saddle following the climb of Mursaudid. After two hours had elapsed the main party with my bed arrived: fortunately, for the temperature fell to 41° that night and there was a heavy dew. Mosquitoes, the first of the journey, were a pest, and one fell asleep and awoke to the piping of an owl—a nightly performance during our stay, though he chose another angle of the jungle and retired some distance. *Ghaf* was the predominant vegetation of the oasis and bright green *thurmid* the chief scrub. Tamarisk shared the mud banks with the date palm. Bird and insect life was disappointing. Two flights of about 150 sandgrouse came to water early morning, and I collected specimens of them and a wagtail, redstart, and desert-chat. Crows were also observed.

The jinn superstition was too strong for all but two of my Badus, a Rashidi and Karbi, who came shooting with me, and oddly enough these two promptly went down, one with an ankle boil, a disease prevalent amongst them, and the other with a three-day recurring fever. Both were subjected to exorcism treat-

ment—*Ra'aba Hamra*, by their Bait Kathir companions. The imprecations in the Shahara tongue of the mountains, the raising and lowering of bodies, the spitting on the wound, I have already described elsewhere. At Shisur I noticed that the proceedings were terminated by a rifle fired into the air. That however is the procedure for the "Evil Eye," so here this bravery was dispensed with. The cure did not work however, and was followed by another next day, the *Habil*, a kind of divination and propitiation. The practitioner, rope in hand, sat about three paces from his patient. A third party was called to hold the end of the rope. Taking an arbitrary length of it with the thumb and forefinger of one hand, the practitioner measured the outstretched length of it with his disengaged arm by means of forearm's length, hand span and finger breadth. The operation he repeated three times, each occasion preceded by a pause to bend his head low over the rope and shake his head, making a curious burbling noise with his lips, and to take a handful of sand which he sprinkled up and down the rope. In conclusion he looked up at his patient and gave him the following remedy: "at sunset take so many dates and so much *samn* and go and cast it away upon the sands."

Early mornings at Al 'Ain I spent over the water with gun and butterfly net: rather barren occasions they proved. To the eastward of the grove was a trough-like pond a few hundred yards long and some fifteen wide, much of it marshy and thick with weeds. To the north and west were the sands of Ar Rimal, here a lofty undulating ridge: to the east a sandy steppe with outcrops of low white hill.

My Badus, in daily dread of raiders, were very anxious to leave Mugshin. The Murra, the Minasir, the 'Awamir (of Oman), the Janaba, the Mahra and the Sa'ar have all in past time left their dead here. "Al 'Arab are killed at Mugshin," said one of my companions, "it is the tomb of the Muslimin." The language seemed extravagant, for we found the place deserted as we anticipated, with no trace of recent visitors, and such is its reputation it is doubtful, despite its plentiful water and magnificent forage, whether Badus ever make use of it for more than the purposes of passing. Here most of my escort were utter strangers, their rations were dwindling, and Ramadhan was upon them withal. By patient counsel I contrived to arrange a small party to accompany me for a two-days' journey into the sands. A selection of seven camels and men was made—it involved my changing my mount—and with the Rashidi guide we were to strike into the sands at Al 'Ain on a north-westerly course and thence out again at Mursaudid, whither the rest of the party would return on our old tracks to await us.

We gave our camels a final watering at 9.0 a.m. at the brook where my aneroid read 380 feet. Thence we proceeded on a course of 305°, and leaving the *ghaf* forest behind us entered the Ramlat al Mugshin. Low red sands were succeeded by higher ridges of dunes lying towards the north, which we reached after a couple of hours. Vegetation in the troughs was scant, chiefly *abal* and *thurmid*, and the only bird was a black and white wagtail, which I shot. The area was called Umm Dasis, and according to my guide there was here a filled-in waterhole in the sands which would support a *gom* of forty men and camels for seven days if an enemy occupied Al 'Ain. Beyond Umm Dasis our course was roughly 290°, the dunes growing more numerous and of a larger kind. Their

surfaces consisted of a collection of smaller dunes rising tier beyond tier, unsymmetrical in relation to one another, but with the exquisite roundnesses of natural perfection. All around was a vast ocean of billowing sand, tilted up in places to sudden frowning heights. The sun's almost vertical rays in these tropical latitudes afford no contrasting shades, and the first impression is one of a sense of exquisite purity of colour. At close quarters the sands are so steep that you dismount from your lofty saddle while your camel plods his heavy way up the most precipitous slopes, slithers down the far side marvellously foot-sure, and arriving at the bottom takes a brave little run to help him on the next upward slope. The surface, so smooth at a distance, is in reality lined with faint corruscations more or less parallel like tiny wavelets on sea sands, and what at a distance is a sheet of pure red colour, when closely approached sparkles with shading glints of greens and gold. A gentle breeze blowing from the north sweeps up the loose surface sands to carry a filmy wisp over the top and thus builds up a flat rim along the upper edge of the sands and facing to leeward. The close-up effect is that of a centurion helmet; but in the far distance the winding ridges of the dunes look like the walls of some fair city built upon a hill.

We halted at sunset south of a lofty dune called Ga'ida Mandar. The temperature fell to 41° dry and 36° wet bulb when I awoke at midnight to see the Southern Cross low over my feet; Canopus had disappeared and Scorpio stood erect, his tail resting on the horizon. The following day our course for the first hour was 295°, then became 270°, and very soon 215°, and so continued for most of the day. There were two half-hour halts, one to shoot a crow, the only bird to be seen that day and one which proved to have white markings, the other for a lunch of dates. What vegetation there was was withered, and when the Badus struck with their canes upon the dry dead stalks these snapped like chalk and fell lightly to the sand.

As we proceeded south-westerly odd *ghaf* trees became more and more frequent, the offshoots of the northern branch of Mugshin. The day grew extremely hot as it wore on, and when sunset came there was no sign of the dune of Mursaudid which would mark our camp. It was indeed a great way off. A shout from two of my party riding ahead announced the new moon of Ramadhan, the beginning of the holy fast month, and for my companions an occasion of grave importance. Very soon they had couched their camels, stuck their rifle barrels downwards into the sand, and loudly chanted their prayers. We were once more on the march. The hour was 6.30 p.m., marking the ninth hour in the saddle, and we strained our eyes for sign of our night's camp. Our shouts were intended to discover the direction of the rest of our party at Mursaudid, and to apprise it that no enemy was approaching, and in this my electric torch was of use. Our guide, whose accuracy I had begun to make excuses for, received the most ample vindication when we espied immediately in front the camp fires we sought.

We may leave the narrative of my journey at this point to consider the eastern borders of the great sands, the names of the sands, and the tribal distribution, information which I had in part acquired from my earlier journey and was now to be amplified by my two Daru' *rabi's* who had come from Oman by this way.

We have already seen that the southern edge of the sands is running in a general south-westerly direction from Mugshin to Umm al Hait, and thence west-south-westerly to a point a day's march north of the Hadhramaut mountains and so onwards north-westwards to the western limits of Najran.

The eastern border of the sands is as follows: Eastward of Mugshin it continues in a general north-north-easterly direction for a four-days' march to Qarn as Sahama, thence it turns due north, passing thus within a day to the westward of Ibri, hugs the west side of Jabal Hafit, and so on as a spur into the Oman Peninsula backing the Trucial Coast. This spur I had crossed in a journey from Sohar to Sharja in 1926.

The sands stretching away across the Peninsula to north and west of these respective borders are known generally as Ar Raml or Ar Rimal. To the tribes that use them, however, the sands are known and called by regional names. Where on their borders wadis reach them from the coastal mountains, the neighbouring sands take the name of the wadis: thus Ramlat Mugshin, Ramlat Umm al Hait and so on through the list of southern wadis recorded earlier in this paper. Northwards along the eastern edge of the sands are Ramlat Sahama, Ramlat Qarn as Sahama, Ramlat Umm at Tabul, Ramlat Umm al Bakhur, Ramlat Ghurbaniyat, Ramlat Ghusaiwara and Ramlat Khatam. These sands are small and local and are used seasonally by Badus of the steppe who do not use the great interior sands.

The great interior sands consist of belts said to be almost parallel with one another with a south-west to north-east axis. If a start is made with Mugshin, the great belts follow in the order of Ghanim, Hibak, Dakaka, Suwahib and Jafura. In the north they are said to rest largely on a considerable belt called Qidan lying to the south and west of Liwa. In the south they rest on the sands of Kharkhir, Umm al Gharib, and Qusman that lie inwards of the border sands bearing wadi names. The slope of the sands is said to be upwards to the south-west where water is said customarily to freeze in winter.

The tribes who are pre-eminently dwellers in the great sands are: (1) Murra approaching from the north-west; (2) 'Awamir approaching from the north-east; (3) Ar Rashid and Bait Imani sections of Al Kathir approaching from the central south. They alone dwell in the sands all the year round, living in black camel-hair tents.

The tribes normally using the border sands only are Manasir, Mizariya, Daru', Hal al Bu Shamis, Harasis and 'Afar in the east; Bait Kathir, Mahra, Manahil, 'Awamir, Sa'ar and Karab in the south; but they severally keep within a safe distance of their own waterholes. (The particular "sand" sections of these tribes and the sands they visit are given in the list mentioned in Appendix C.)

Rain is said to fall occasionally in summer as well as winter in certain localities. Wide areas of the sands know neither rain nor waterhole and are impenetrable. Waterholes vary in quantity and quality, but generally speaking the water of the sands is held to be brackish in the extreme: some that the Badus cannot use for coffee. Shisur and Mugshin were declared sweet in comparison. Salt water is known in Ghanim at a foot or two's depth by scraping away the surface sand. Water is found at 2 fathoms in Kharkhir, 3 to 4 in Hibak, 4 to 6 in Suwahib, 6 in Jafura. In the western sands waterholes are said to exist at abnormal depths.

The average Badu has ten to fifteen or twenty grazing camels (*bosh* as distinct from *rikab* or riding camels)—a shaikh perhaps fifty. In summer they stay close to waterholes, watering every second day, or if rain is about may remain five days absent. In a good winter with rains and consequent pasture, an unusual situation, they may wander for two months from their accustomed waterholes—man depending upon camels' milk for his sustenance, but normally they must water their milch camels every ten days or so.

The sands know two saddles. The double-poled saddle which is placed over the camel's hump, *shadad*, the normal saddle of much of the rest of Arabia, is used only by the Murra, the Sa'ar and Karab. By the entire remaining tribes, as indeed in Oman and throughout the whole of South-Eastern Arabia, the *zana* is used, a small light framework (without poles) straddled with saddle bags and covered by a goat skin. This is placed behind the hump, where the Badu invariably rides, normally in a kneeling position with his feet tucked up under his haunches. To stand long distances, as for raiding, to carry his master and a ten-days' water supply for him, and to survive long and hungry marches, the camel has to be fattened up beforehand. The Badu travelling light lives on a pancake of unleavened bread only, and the doubtful fruits of the chase.

The eastward limit of the great sands has been seen to be roughly in longitude 54° E. Eastward of this is steppe to 58°, succeeded by a spur, or rather island, of sand in the triangle of Ja'alan, sands I skirted in 1928.

The term Rub' al Khali as at present marked on the map is thus not wholly sands, and the term Ar Rimal (literally=the sands), which has been suggested as an alternative label, cannot therefore apply. But these terms are understood by the local Arab in a literal and therefore limited sense. Thus Rub' al Khali connotes those parts of the sands and steppes which will not support life, and Ar Rimal sands whenever found and whether supporting life or not. Our use of the term Rub' al Khali to denote the great Southern Desert as a geographical region is not understood by its inhabitants.

The problem of the general physical structure of South-East Arabia has so far been wrapt in obscurity. The following discoveries may bring a certain amount of light. The eastern limits of the sands in the spur of the Oman Peninsula I found at 1200 feet. To the westward of Jabal Hafit it is about 1000 feet. Ibri is said to be at 1600 feet, so that the edge of the sands in that latitude, bearing in mind the direction of its wadi Al 'Ain, must be considerably lower. The height of the sands at Mugshin was 490 feet. Hence the eastern edge of the sands, by deduction, falls from north to south.

To the eastward of this long eastern edge of Ar Rimal is a steppe which shelves up north-eastwards to the great Hajar backbone of Oman, whence the drainage wadis Al 'Ain, Al 'Aswad, Al 'Amairi and Musallim follow almost parallel courses south-westerly to extinguish themselves in the eastern borders of the sands. To the south-east of Mugshin is another steppe having no discernible slope but said to be bounded on its north-east side by the isolated ridge of Jabal Hugf. On its south-eastern side its wadis Qadan (Ghudun ?), Raunib and Haitam (I crossed them at sea-level in 1928) drain south-east into Sauqira Bay.

On its south-western side, Jaddat Harasis receives the system of Wadi 'Ara,

the inland drainage of the northern extension of Jabal Samhan. Where I crossed it in its sources on my previous journey the wadi heads were running north-east, and aneroid readings varied between 1100 feet east, 1400 feet west. To the eastward of Jabal Hugf the only considerable wadis, Halfain and Andam, fall away from the eastern Hajar of Oman and run due south, in part to drain into the Gulf of Masira.

These considerations would appear to show the following general physical structure: There is an area of depression at the south-eastern extremity of the great sands, forming a corridor with axis north-west to south-east through Jaddat Harasis to the coast of Sauqira Bay. North of this corridor the general upward slope is towards the north and north-east: south of the corridor it is to the south-west and west.

An item of considerable geographical interest is the presence of desert quicksands at the northern end of the corridor, where it meets Ar Rimal. The extent of Umm as Samim, as the area is called, is said to be a two-days' march in any direction. In appearance a sheet of salt plain, it gives no indication to the unwary traveller of its treacherous bogs. Many have perished here and only certain Daru' Badus who come to collect salt on its borders are said to brave its secret passages: raiders, as might be expected, give it a wide berth.

Von Wrede, the Bavarian soldier of fortune who in 1843 penetrated the Hadhramaut in Moslem disguise, records a similar phenomenon, its place-name Bahr as Safi. Von Wrede said that he marched towards one of the white patches armed with a plumb-line of 60 fathoms. "With the greatest caution I approached the border to examine the sand which I found almost an impalpable powder and I threw the plumb-line as far as possible: it sank instantly, the velocity diminishing, and in five minutes the end of the cord had disappeared in the all-devouring tomb."

Without in any way wishing to raise another Palgrave hunt it is necessary to observe that most of my Badus had raided in the sands to the north of the Hadhramaut, in fact the Karbi came from there, but none had ever heard of Bahr as Safi, and all averred that the phenomenon described exists only in Umm as Samim, lying 'twixt sand and steppe to the north and east of Mugshin and south and west of Ibri.

To return to Mursaudid and the journey homewards: February 1 was the coldest night we had experienced, the thermometer falling almost to freezing-point: dry bulb 38°, wet bulb 35°. Leaving Birsa on our left hand we proceeded on a course of 245° through some low dune country, where I saw a bustard, the only instance throughout the journey, but missed it. A halt was made at 11.0 a.m. in the interest of the camels, and while I wrote my notes under the shade of an acacia my Badus were soon so many sprawling sleeping figures each with his rifle as his pillow, for no man in that desert ever allows rifle out of arm's reach. The acacia grew thin as we moved on, carrying the sands with us on both sides. Passing the large dune of Yighal on our left we halted for the night 2 miles short of the end of the grove, an area called Umm Maraha. Adequate pasture was said to exist in Wadi 'Aradh 15 miles to the westward, but the heavy sandy going there, coupled with the expectation of water, rain remnants in the steppe to the south, decided my party to take the latter course.

The next two days were miserable in the extreme. A sandy plain, hot and woefully exposed to sun glare, bearing scarce a blade of green scrub, much less a tree, surrounded us. Here and there were patches of small and shining red rubble, and in the early stages, spurs of sand, scarcely attaining to low dune proportions, bestrode our path. Those that formed landmarks bore names: of such were Al Hadaba and Ar Rakib. Our homeward journey was more tiring than the northward trek had been because we carried the sun in our faces, and on this day, against my general practice, I found an afternoon halt for a short sleep necessary, albeit the only shade available in the scorching plain was that afforded by a camel saddle turned up on end. My map traverse closing showed us to be approaching the point where we had watered from the rain pools when journeying north. Thither we arrived in the narrow wadi bed of Umm al Ha between banks of what looked like shining putty.

The Badus, disappointed at not finding the water on which they had imprudently counted, were for making a continued night march. The position had to be faced that they were fasting by day and had no water that evening worth speaking of, and the nearest waterhole was a day's march ahead. The camels could carry on for some days more without water, but the Badu finds a day and a half's abstinence as much as he dare. Hence, while the main body camped in Umm al Hait, Shaikh Sultan of the Masan section of Bait Kathir and three companions pressed onwards with most of the party's empty water-skins to Shisur. The plan was that my main party would proceed on the morrow in their tracks to halt at Hailat Bil Rizaz, some 12 miles east of Shisur, and that the watering party would turn back to meet us there with full water-skins. We started at sunrise, I having to go thirsty as the water available was sufficient only for porridge. The Arabs were in worse plight, for they were genuinely fasting by day and had had little if anything to drink overnight. An hour's ride brought us to the head of Wadi Dauka, whence we turned south-westwards, and so continued for the day across a desolate plain with a scorching tropical sun in our faces. My nose and lips were already raw from the last few days' sun, and one now fully appreciated the ample folds of the Arab head-dress for its protection by day and its warmth against the cold nights.

Four hours brought us to a section of the plain called Bil Lukish, where the usual sandy floor is strewn with sandstone rubble and scattered small black flint fields. A white expanse of shimmering mirage obscured the skyline ahead, and practised its habitual deceit as it receded before our thirsty column. There was no life, the only movement in this wilderness coming from sand devils which raised their spinning columns and seemed to be accompanied by a momentary refreshing blow. Not a vestige of vegetation appeared till the late afternoon, when we came to a small snake-like depression with scant scrub. The Badus honoured it with a name, Sulaiyil, and halted for the afternoon prayer. So we continued till sunset, when the Horn of Bil Rizaz showed above the skyline, a conspicuous relief in the flat plain, and just short of it the *haila* of *hardhai* bushes where we were to make our evening camp. Sunset prayers were said while my escort scanned the bushes for sign of our water party's camp fires or a lurking enemy. We crawled into camp a dispirited party after eleven hours in the saddle, they without food or drink. The water party had not arrived, and might have missed the way in the dark, so that my gun and

electric torch were requisitioned: dangerous but necessary measures. Three hours later the party arrived. Dawn was a brilliant blaze of colour, and following a mild night, a strong north-east wind got up and continued all day. Men and camels went off early to water and dallied there the whole day as was their wont.

The next morning was decided for our start, but the sudden illness of one of our Badus, a serious stomach trouble, delayed us. He recovered as a result of a branding operation—a rifle-bolt striker made white hot and applied to seven places: left heel, right heel, behind each ear, centre of forehead where it joins hair, top of head, and over navel—*ghuwaira* they called it. The following morning the camels were once more watered, and in the afternoon we moved a few miles down to the end of the copse preparatory for an early morning start. Two camels were missing. They, with accustomed intuition, had decided where home was, and when we caught them up were taking an uncannily correct line for the mountains below the horizon.

I had proposed to return from Mugshin by way of Katibit and Andhaur, but my Badus peremptorily refused. I was equally averse to their plan of the Ghudun by which we had come, hence Dauka, the wadi we were now returning by, represented a compromise. Our south-east course on leaving Hailat Bil Rizaz led across a bare sandstone plain. No longer mindful of my instruments (I had upset my mercury bath overnight) we could trot now as we pleased. Crossing the wadi depression of Al Hauf, a tributary that enters Dauka to the north, we approached a low ridge marking the main wadi channel. Fronting it was a large conspicuous chalk-white mound. A half-mile depth of wadi shrubs, chiefly *salam* bright with its yellow pompoms and *markh*, was backed by ridges of red and yellow sandstone with characteristic pyramidal hills and flat sliced peaks. Here at Hanfit we had struck Wadi Dauka where it turns to run north-west. Our own course on the morrow lay through its southward reaches. On leaving camp Dauka was almost immediately joined by two small affluents, Dha'arfit and Ista. An hour and a half later we left the wadi bed to cut off one of its bends and thereby crossed the stony plain of Jaddat Na'ama. There we caught our third different snake.

Beyond were two eminences, beneath which water will collect after rains and therefore of honourable mention by the Badus, who called them Adhabug and Umm Arak. No water was evident though the pitted surface of the sand hummocks about the tree roots and the swept path of recent freshlets pointed to local rain. And in further proof of this we saw on the skyline a drove of milch camels and sheep. Before us were the foothills of the Nejd fronted by a conspicuous island of hills, which split the wadi into two embracing channels. Aduwab was its name, and the neighbourhood provided us with a mixed bag of fossils and snakes. There were nests of large sandstone oysters, all presumably of the same kind. In one spot I saw twenty together lying scarcely covered by the fine sand of the wadi bed, as they might have appeared on an ocean floor. Three snakes proved to be of one kind, the venomous *abu saihah*, so named because of its hissing noise. Two other reptiles, beautiful lizards which I thought at first might be chameleons from their changing colours, were also caught. They are a large but unedible variety called *shuwaira ash shams* from the fact that they alone amongst desert life disdain refuge from the sun.

They are said to delight in the most glaring eminences facing the sun to which they nod their heads. A royal blue in colour, the heavy pouch under their chins changes to silver at death and their tail is red, smooth, and rat-like.

Beyond Aduwab we entered low hilly country and watered at Mughagha, a rain-hole obviously freshly dug out by the Badus whose camels we had met that day. They turned out to be Bait Kathiris who had been attracted thither by the recent rains, and from them we obtained plentiful milk; they were the most northerly human beings we had met coming out of the desert. This locality, where we later decided to halt for the night, was called Bin Ju'ai. A cold night, the temperature falling to 47°, was followed by an early morning's start. At first steep climbing brought a change and an increase in the flora. The predominant vegetation in Wadi Dauka the day before at 1000 feet had been *salam* and *markh:* that day at 1500 feet it was the *samr* acacia and the beautiful palm-like *asaf* (*ghadaf*). Three hours on a south-east course through broken uplands brought us to a large conical hill, Hamra Miskad, where at its foot the aneroid registered 1750 feet. From this point we climbed still more steeply midst valley slopes strewn with large black cinder-like rubble and thence reached a high point commanding a wide vista of conical and pyramidal hills in every direction, the characteristic series we had passed through the day before and that lay ahead on the morrow. Thence through a low red banked depression backed by more of the light-coloured hills—one of the sources of Wadi Dauka—we reached a small upland plain. Here were a few scattered frankincense trees and some rude trilith remains, the most northerly instances of either met with in Wadi Dauka, and a sudden increasing of animal life, hare, vulture, sand-grouse.

The fear of *giman* was now left behind, so that the next day I with three companions left our party at Qarn Shaiba to proceed eastward to visit the water-hole of Hanun and the Wadi Ba Musqaiyif, the latter from its name promising much in the way of "trilith" remains. A due easterly course through desolate hilly country surfaced with black flint brought us after two hours to a high conical hill, Qarn Hanun on one hand, and the similar-shaped but triple-system Ardaf on the other.

Just beyond it we came upon a spectacle of much grandeur. The earth suddenly opened to form a V-shaped fissure of crystalline rock which descended in terraces of sparkling whiteness to a green wadi floor 150 feet below. The uppermost stratum was often overhanging: the bottommost also in parts denuded to form long shallow caves. This was Ghabartan, a tiny winding wadi which joins the Rakibit within view, and is thus a source of the Katibit. Here at its tapering source we looked down upon the green pond of Hanun in its bed. The waterhole occasioned the usual disillusionment when I recalled the Badu stories in its praise—praise albeit intelligible in a thirsty land where throughout the long marches of the Umm al Hait system there are only some seven such waterholes. A specimen of the water deemed sweet by the locals was taken. It was brackish and scarcely any better than Mugshin water, but fortunately recent rains had obviated the necessity of our watering here. A well-preserved fossil, a bulbul, and a blue rock pigeon were the other items of interest. Ba Musqaiyif, which is the source of Ghabartan, abounded in trilith remains variously orientated with the axis of the winding wadi; none was found inscribed,

perhaps because of the age-old weathering of the stone of which they are composed. Near by were the ruins of a considerable but crude building consisting of eight long narrow cells with a Muslim grave in it.

We rode back in the afternoon on a course slightly south of that of the morning, through small frankincense orchards, and so reached Sa'atan our camp for the night, whither our main party had proceeded direct. Here is one of the sources of Wadi Dauka. Tribesmen, Kathiris and Bait ash Shaikh with their flocks and herds came to sup with my Badus who had chosen the hill caves for their night's residence. A blazing camp fire, here of fragrant frankincense logs, was necessary against the cold, the temperature standing at 43° F. in the early morning. The height was 2000 feet. Our course lay past a large and conspicuous hog-backed mountain, Jabal Fahad, whence we turned south-west into a moderate wadi, the Hila (Haila ?) by name, which is an upper course of the Haluf. We thus continued for an hour, the enclosing cliff some 130 feet high being weathered to present the appearance of a side of a shell-stricken house in a war area. The lower slopes were covered with dark-coloured rocks speckled with a white efflorescence. Soon we climbed out by way of a pass on the left bank which gave entry to a smaller wadi tributary named Saig Hawar. I halted to shoot some mountain partridge here before proceeding upward on a south-easterly course, whence we reached the rolling downs of the divide, Al Qatan.

A sudden increase of bird life, yellow meadows and grazing cattle and prolific vegetation denoted that the desert was behind us. I halted in a *tishgaut* jungle to collect a curlew. My impatient escort pushed on, much exercised by the news of the murder of a Kathiri tribesman by a Mahri during our absence—an old blood feud—and war was in the air. We halted in a green and fruitful wadi, Umm Gaba'ad, in the district of Gurthunut, a delightful spot which might almost have been a wooded vale of England's west country but for its tropic vegetation. The night temperature was 54°, datum which a large Ramadhan moon enabled me to record without the aid of a torch. A fox paid a moonlight visit to the scene of last night's slaughter, but we refrained from risking a shot at him in consideration of the Qara villagers (Bait Qutun) who lived in their cave dwellings up a sheltered gully opposite. A high wind sent white clouds from the sea scudding low over us. From the top of a small hill near by spread out a glorious sunlit panorama of the plain of Dhufar, perhaps Ophir,* skirting the Indian Ocean whither the yellow face of the Khutim went rolling down, and I took bearings on the distant villages.

We were now in the *dira* of the Qara, the cattle-breeding tribe *par excellence* of South Arabia. Their singular practice—for they have camels too—of using no camel *wasm* may suggest that they originally came by way of the sea, though their own tradition is that they came east at the same time as, and in company with, the Mahra. Their movements in the mountains—they are nowhere found north in the Nejd—are limited to localized sectional habitats where they

*Local word resemblances to Ophir are frequent. One of the surviving ancient Hadara tribes is the 'Afar with a language belonging to the group of Mahri (Himyaritic ?). Two of the chief wadis that produce frankincense for which the country was historically famous are Wadi 'Afar and Wadi 'Afaur. The word *'afar*, or a slight modification of it, is the common word in the Hadara languages for "clouds" and "red."

dwell in caves. They are not therefore Badus in the strict sense of the word as has been supposed. With them are their fetchers and carriers, the inferior Shahara, once the proud possessors of the land, and whose speech is still the "speech of the mountains." Their numbers to-day scarce reach 1000. Some of their types appear to the foreigner almost indistinguishable from certain of their more exalted Qara neighbours, but that they are comparatively race-pure is inevitable from the system whereby other tribes will not give them their daughters in marriage, a parallel to the case of the Baiyasara in Oman.

Our southward course lay across the rolling downs cloven by deep intruding valleys, densely wooded and white pebbled. I set off with my gun down one of these while the camels kept to the gentle tracks of the longer contours. Herds of cows were winding down the opposite slopes, and, dropping 1000 feet, we met them watering over the spring of Furum. The wadi bearing the same name is a tributary of Wadi Nihaz by which we were to make our way to the plain. At the base a spilling trough was edged with moss and maidenhair, and flitting near numerous strange birds, one a brown creature with Prussian blue head and top-knot, that filled the valley with their song. Heavy undergrowth and dense thickets obscured any but short-range shots, and as I had run out of No. 8's my specimens were generally too mutilated to be of any scientific value. As we descended the valley the vegetation became more and more dense with fig and sycamore trees festooned with long creepers and fragrant jessamine. The pebble bed was choked with huge boulders where we left it to move along a path which rose on the left bank as the wadi bed declined more steeply. I was accompanied by the Qara Shaikh of the Bait Qutun section whose country it was, and whose father had been the Bents' guide. He was fasting, for the Qara are as punctilious in their observance of Ramadhan as all the other sons of these climes.

Below us was 200 feet of waving jungle, above us the same, and above that an abrupt cliff roofed with rolling meadow. The trees thinned out as we proceeded and led to an open bluff where I shot a pale harrier of brilliant yellow eye, a true *baz*. Three hundred feet below, at the junction of the Furum and the Nihaz, nestled a lake of variegated green meadows with the hayrick-like homesteads of the Qara. It was an exquisite picture after the wilderness of the sands. Here literally was Arabia Felix. We descended to Bauta, as the vale is called, to find the rest of our party already arrived. The saddle was welcome after a 10-miles' tramp, and thus proceeding we halted just after sunset below the famous cave Sahaur. A black gaping hole it appeared in the hillside above us, where a panther was heard that night. The locals told us it had recently killed a camel, a not uncommon occurrence. A climb of 250 feet soon after dawn on the morrow brought us to the cave, a yawning semicircle about 100 feet wide and 40 feet high at its mouth, its roof a system of stumpy weathered stalactites where rock pigeon flitted for cover at our approach. Legend has it that the cave continues for miles back into the Qara mountains where jinns share a dark existence with snakes and scorpions. A low sloping hole on the left side permits a crawling entrance, and wriggling through it a distance of 10 feet brought us into a large inner chamber of irregular shape and with comfortable head room. My torch showed its formation to be a pure dazzling white crystalline rock. There was a slow but continuous drip of water from innumer-

able stalactites of slightly darker hue, and small stalagmites sprang up in places from the floor. A giant pillar had a basin-like annexe on an almost perfect hollow hemisphere of the same formation and some 3 feet in diameter. This chamber led to others, their entrances often very constricted, and I spent half an hour in stifling air investigating them. One proved a veritable cage of bats, a specimen of which was collected. We emerged to hear the shouts of our impatient party come up to us, and descending to the camp we mounted and set off for the coast.

I little knew I was missing the famous phenomenon of Ghaur Fuzl, a deep natural hole boring the wadi bed immediately below Sahaur, which Bent identifies with Ptolemy's Diana Oraculum. Half an hour sufficed to bring us to a slanting meadow at the foot of the escarpment a mile westwards of where Wadi Nihaz debouches on to the plain. And there in the distance lay the white city of Salala amidst its coconut groves, that marked the beginning and the end of my journey.

I wish to acknowledge my indebtedness to His Highness the Sultan of Muscat and Oman Sir Taimur bin Faisal, K.C.I.E., through whose kindly influence with the tribes the journey was made possible; to Lieut. A. J. H. Dove, R.E., who examined my astronomical and kindred data; and to my Secretary 'Ali Muhammad, who did the skinning of the birds and the preservation of other specimens, often in trying conditions after a day's march.

APPENDICES

Spelling of Place-Names

[In accordance with the usual custom of the *Journal* we have omitted the marks of quantity, $\bar{a}$, $\bar{e}$, etc., in printing the place-names in the body of this paper. The names in the body of the paper have been examined and occasionally revised provisionally by Mr. Laurence Lockhart and the Secretary P.C.G.N.; but some cases of doubt remain owing to uncertainty in interpreting the author's typescript.]

Appendix A. *South Arabian Nomenclature*

The names mentioned in map and paper are those in use by Bait Kathir Arabs, thus when these names are not Arabic in origin, they are Arabicized. The pronunciation has the following features:—Z has often the value of the Arabic letter *Sad* (ṣ), *e.g.* Shazar=Shaṣar; Q has invariably a G value, *e.g.* Qarn=Gerin; J sometimes has a G value, *e.g.* Nejd=Neged; D has often a T value, *e.g.* Gasad =Gasat, Sadh=Sath; final B, L, M, and N are so clipped as to be almost unheard, *e.g.* Dhahibū(n), Samha(l), Qata(n), al Gha(b); initial DH has a lisped L sound, *e.g.* dhabb (lizard)=labb. Some of these features, notably the last three mentioned, would appear to show that place-names having such peculiarities probably belong in origin to the Hadara dialects. Ba is the local equivalent of Abu.

Names of places where water collects are often Bin (literally son), Banat (wadi tributaries are always so designated). Literally the Hadara equivalents of Bin and Bint are Bir and Birt: sometimes the B is elided and they become ir and irt. Bit (=Bait) for tribal sections. The Arabic or Arabicized place-names are not used by the bulk of the population, who have their own Hadari words, hence many places have three or four different designations in accordance with the local tribal tongues.

[Long lists of equivalent names in Arabic, Mahri, and Shahari omitted: they are preserved in the Library for reference.]

Topographical Terms used in the Sands in Rub' al Khali

Al Hūta	vegetation
Rubal (Rababil)	sand banks
Shagāg, Sarūg, or Sahama ..	tracks between two ridges
Ga'āiyida	large sand dune
Ga'īda	largest sand dune
Urūg	low line of dunes
Zibāra	hard sand (good going)
Ath ath or Beth beth	soft sand (heavy going)

Appendix B. *Aneroid and Thermometer Records*

[Records and note on the reduction of the aneroid readings not printed, but available for reference in Library.]

Appendix C. *Tribes that enter the Sands of South and East Rub' al Khali*

[List of tribes, "Sand" sections of the same, camel *wasm*, and Sands entered, not printed, but kept for reference.]

Appendix D. *List of Head measurements*

[These, with a skull, are in the possession of the Royal Anthropological Institute. The conclusions drawn by Professor Seligman are given in his contribution to the Discussion.]

Appendix E. *Flora of Central South Arabia*

Libaniferous trees:—1. Frankincense, three varieties: Negedi (Nejdi), sha'abi (or somali), and shazari tree of mughur. Negedi is the famous tree of the three. It grows on the intramontane wadi slopes between 2250 feet and 2500 feet. 2. Mulukh: a tree growing on the plains along lower wadi beds at 500 feet. Gum exudes naturally from the branches and is of an edible kind. 3. Tishgāut: found on the Divide (2750–3000 feet). A low bushy tree, in numbers from a distance resembling vineyards of Syria. Its gum is flattened into cakes and sometimes exported.

Vegetation in the mountains from 600 feet to 3000 feet:—Mushta, thamar, la'ilāūb, al khaimur, mughalīf, huraūm, miṭān (this provides a heavy wood which is said not to float in water and is used for making *ghatrifs*), subāra, and khafāūt.

On the Divide (Qatan), 2750–3000 feet:—Tikidauhauṭ, laifit, zurfit, ra'i zintirāūt, tishgāūt, gushar, qarhahaur, and dhubdhubaut.

In the "Masīla" of wadis or plains:—Samr (acacia), Sheheri—Saidhna, the most important camel fodder. This is the predominant intramontane vegetation between 2000 feet and 1200 feet: none below 1200 feet. Markh and hardhai trees, almost equally important for fodder, become predominant at about 1200 feet, and remain so during these mid-courses of intramontane wadis. Dha'uwut, haylaima, dha'a bushes, or scrub are next in importance, though they do not survive rainless periods so well as the first three. They thrive in Sih at 1500–1000 feet. Ragus, al gha(b), alithal (tamarisk, met first time at 1200 feet, where the samar acacia was left behind), gutufa (wadi hill slopes), al 'usfa, raka, qilqa(dh), 'arad, jinn tree, qarada or qaraira, dumdum, dur'ma, hisham, gandra, baluk, aigail, fani, 'utib, hauwai, saaban (lubdi thail), dhanuna or ma'anun, asaf or ghadaf (palm bushes which provide material for rope making), tanfit, kaithi, dhuwaila, harmel, eshriq, ilisunam, and rimram. The last seven named have medicinal uses. Jhamam, turfa' (generally at heads of wadis and salt plains), huguba, arad, shaukhir, rusris, mailuh, laibid, iskud, khurais-shabah.

In sandy soils on the verge of the Sands at 500 feet:—Ghaf (acacia), tarthuth (resembling the head of a bulrush), basul, al ashera (the al ashkhara of Oman; first isolated example found at 1050 feet at Hailat Shisur on edge of sands, predominant vegetation at 500 feet, last example at Maraha), thurmid.

In the Sands:—Al 'abala (whose fruit is khuri), zahara, birkana, gusays, 'angud, al ahshaishah, zaraiga, thurmid (resembling haram, occurs in occasional clay depressions), and hardhai.

Appendix F. *Fauna*

[Long lists of Birds, Mammals, Insects, and Reptiles, with Arabic names locality, and altitude, not printed but preserved in Library.]

Note on the Collections by Mr. N. B. Kinnear, of the Natural History Museum

During the expedition specimens were collected whenever possible, and the following is a brief account of the collection, which has been presented to the British Museum. I am indebted to the various experts in the different departments at the Museum for the identification of the specimens.

Mammals:—Five species of mammals were collected: a leaf-nosed bat *Asellia tridens*, two hedgehogs *Paraechinus dorsalis*—a desert form ranging from Algeria to Persia—and a single adult male of the little-known Jayakar's Coney or Hyrax *Procavia syriaca jayakari*, originally described from near Muscat. Of game animals there is an example of the Arabian Oryx *Oryx leucoryx*, a rare antelope of which the distribution is imperfectly known, and two specimens of a gazelle, probably a race of the Arabian Gazelle *G. arabica*, but owing to the lack of material in the Museum it is impossible to say for certain.

Birds:—Sixteen birds were collected of which the Common Kestrel *F. tinnunculus*, Pale Harrier *C. macrurus*, Kashmir Redstart *P. ochruros phoenicuroides*, White Wagtail *M. alba alba*, and Tibetan Desert Chat *O. deserti oreophila* are either passing migrants wintering in Africa or cold-weather visitors to the Hadhramaut. The remaining species are residents, but some, the Senegal Sandgrouse *P. senegallus*, the Brown-necked Raven *C. c. ruficollis*, Brown Chatterer or Babler *A. squamiceps squamiceps*, Arabian Stone Curlew *B. capensis dodgsoni* are also found in the adjacent countries, while the Arabian Bulbul *P. xanthopygos reichenowi*, Arabian See See *A. heyi intermedia*, and Finch Lark *A. cintura pallida* are confined to the southern part of Arabia. The Finch Lark is a very rare bird and was only represented in the Museum collection by two specimens collected by Major Cheesman at Hufuf.

Reptiles:—Ten different kinds of lizards and three of snakes were collected. Among the lizards there are three new species—two belonging to the genus *Ceramodactylus* and one to *Uromastix*—which will shortly be described by Mr. Parker. The remainder include examples of *Pristurus collaris*, *Agama jayakari*, *Prynocephalus arabicus*, *Acanthodactylus cantoris arabicus*. and *Chamaelon calcarifer*, all species confined to South-East Arabia, *Gymnodactylus scaber*, found from Egypt to Sind, and *Phrynocephalus maculatus* and *Uromastix microlepis* inhabiting adjoining countries but not previously recorded from the Hadhramaut.

The three snakes are *Malpolon moilensis*, *Psammophis schokari*, and the horned viper *Cerastes cornutus*—all well-known species in desert countries.

Insects:—Sixty-three specimens of insects were collected, including eight butterflies of which two are new races of wide-ranging species, namely *Charaxes varanes*, Natal to Abyssinia, and *Charaxes hansalii*, Sudan to Somaliland. The other butterflies are *Precis hierta cebrene*, already known from South-East Arabia, and a single example of the well-known painted lady *Pyrameis cardui*. The rest of the collection includes examples of desert-loving Coleoptera (beetles), Hymenoptera (wasps and ants), and Orthoptera (grasshoppers).

Appendix G. *Geology and Water-supply*

[Long list of specimens with locality, altitude, and remarks not printed but preserved in Library.]

Note on the Collection by Mr. L. R. Cox of the Natural History Museum

The fossils collected are all Middle Eocene in age, and belong to species known to occur in India, Somaliland, or Egypt. The state of preservation, as casts in a white limestone matrix, is similar to that of the contemporaneous fossils of those countries. The following have been identified:

Gastropoda:—*Campanile* sp. (Wadi Dhahair); "*Natica*" cf. *longa* Bellardi (Wadi Dhahair, Bin Ju'ai, and Sa'aten); *Gisortia murchisoni* (d'Arch. and Haime) (Wadi Dhahair).

Lamellibranchia:—*Lucina pharaonis* Bellardi (Hanfit); *Lucina nokbaensis* Oppenheim (Adhabugh); *Lucina* cf. *quadrata* Leymerie (Wadi Furum); *Cardium* sp. (Bin Ju'ai).

Among the other specimens collected four are geodes, the outer crust of which consists of chalcedony, lined with quartz. They are derived from the underlying sedimentary formation, and are of inorganic origin.

Note on Water Samples by Mr. F. B. Thole, Research Laboratory A. P. Oil Co., Sunbury-on-Thames

Analysis of water samples:—No. 12, from Al 'Ain Mughsin, South Arabia—spring and pools of brackish water: height 450 feet (30 c.cs.); and No. 25, from Hanun, South Arabia—large natural waterhole in fissure in W. Gabatan: height 1860 feet (50 c.cs.).

The details obtainable are:

	Ca	*Mg*	*Cl*	SO_4
No. 12	3·5	2·9	4·0	4·2
No. 25	1·9	1·05	2·5	1·22

All figures quoted in gms./litre. The samples would not allow of any further analyses, and the figures must be taken as approximate only, due to the smallness of samples.

Note on the above by Mr. B. K. Wyllie, Geological Branch A. P. Oil Co.

The Sunbury report shows that both samples have a relatively high mineral content, consisting of calcium, magnesium, chloride, and sulphate. Analysis of the figures however indicates that some other acid radicle must have been present in a proportion nearly equal to sulphate plus chloride. This can scarcely be anything but carbonate or bicarbonate. It is difficult to believe that some sodium was not associated with Ca and Mg in the amounts shown.

DISCUSSION

Before the paper the PRESIDENT (Colonel Sir CHARLES CLOSE) said: I am sorry that our English climate has prevented a larger attendance, because the paper to which we are about to listen is perhaps the most important of the whole session. I should say, to commence with, that any ordinary well-informed person if he or she were asked what regions on this Earth were left to be explored, in the primary sense, would certainly include the great southern desert of Arabia, the Rub' al Khali, the empty quarter, which has been the subject of conjecture for hundreds of years. It is true that we know very little about that quarter, but we

have had some papers read before the Society which have described what may be called the fringes of it. First, we had Major Cheesman's explorations in 1923; then Mr. G. M. Lees gave us a paper on Oman and the Southern Coast of Arabia in 1925–26; and later we had a paper by Mr. Bertram Thomas, who described the south-eastern borderland. All that was, so to speak, touching—not very closely, but almost touching—the edge of that great desert.

To-night Sir Arnold Wilson has very kindly consented to read a paper that Mr. Bertram Thomas has written on his remarkable journey, during which he actually got into that great unknown desert. He did not arrive, perhaps, at the centre, but it was an exploration of unusual merit and of some hardship. It was an exploration which many geographers would have been only too anxious to undertake had it been possible, but, as we shall hear in the course of the lecture, that sort of exploration in Arabia is a matter which depends very largely on the circumstances of the time. It is not possible to say, offhand, that with the utmost pluck, utmost determination, and utmost skill you will succeed. Mr. Bertram Thomas did, in fact, succeed in getting farther than any other European has ever got from the south. He, perhaps for the first time, will give us some idea of that great desert. I will not detain you any longer, but ask Sir Arnold Wilson if he will kindly read the paper, and I hope he will begin with a few remarks of his own.

Sir Arnold Wilson then read the paper printed above, prefacing it with the following remarks:

Sir ARNOLD WILSON: I must in the first place make it clear that the subject of this paper is altogether outside those parts of the Middle East of which I have personal knowledge. I have known the writer, Mr. Bertram Thomas, for more than twelve years, first in the stormy days of Mesopotamia during and after the War, and later in Trans-Jordan: he has held the position which he at present occupies, that of Financial Adviser to His Highness the Sultan of Muscat and Oman, for some five years. In this connection he is primarily responsible to His Highness for the maintenance of the minimum of governance essential for the well-being of Oman—on a strip of coast running from Musandam to Dhufar and beyond, and as far inland as human beings can penetrate. The journey which I am about to describe to you lay in territory wholly within the dominions of H.H. the Sultan, under whose authority and aegis he travelled.

It is not the first important voyage of discovery that Mr. Thomas has performed in Oman. In 1928 he made the journey by land from Sur to Dhufar, in circumstances of considerable danger and great difficulty. It was a strip of territory till then wholly unknown, regarding which our geographical knowledge was restricted to such scraps of information as could be gleaned from the coast, which itself had for the most part been unvisited by survey ships since the days of Hayes, Brucks, and Wellsted. His journey was fruitful of scientific and practical results, some of which have been embodied in papers read before this Society and the Royal Anthropological Institute; a further paper dealing with linguistic studies will shortly appear in the Journal of the Royal Asiatic Society.

In the course of this journey Mr. Thomas obtained information from tribes living in the hinterland which threw considerable light upon the geographical problems of the Rub' al Khali: the knowledge thus gained strengthened him in his determination to penetrate as far as he could into the dead heart of the Arabian continent—an area as large as Germany, France and Spain combined, which has hitherto baffled the enterprise of geographers, travellers, and historians from the days of Ptolemy onwards.

What little was known of it at the beginning of the present century was recorded

by the late Dr. Hogarth in his book 'The Penetration of Arabia' (1905), where he describes the Rub' al Khali in the following words:

"A virgin tract, obscure enough to give a geographer pause ere he argue of its unknown content from the other parts of the peninsula. Between the innermost points reached by Europeans in their attempts to penetrate it, intervenes a dark space of six hundred and fifty miles' span from north to south, and eight hundred and fifty from west to east. This unseen area covers considerably more than half a million square miles, or not much less than half the whole superficies of Arabia. Such an expanse is vast enough to hide many secrets of which the geographer has no inkling as yet; it does, in fact, hide certain half-secrets that he suspects but cannot unriddle. Until it be better explored, the problem of the course and destination of all the copious inland drainage of the south-western part of the peninsula remains insoluble. There may be an important central lake, as Chedufau thought, or there may be more than one, or there may be a southern trans-Arabian channel above or below ground, longer and more important than the Rumma channel in the north. Resultant on such watercourses there may be unknown tracts of fertility and nomad or settled societies of which no rumour has reached us. Or there may be none of these things, but only sand and rock. Until the southern area be better explored, we remain ignorant of the general direction of the main South Arabian slopes, of the relation borne by the south-eastern projection of the peninsula to the rest of the continental mass, and of the origin of the northern Hadramaut waters, and the ultimate fate of the southern waters of Nejd."

Three explorers claim to have had distant views of the mysterious tract in the south-east of Arabia—the Rub' al Khali of the maps—Wellsted from the crest of Jabal Akhdhar in Oman in 1836, Wrede from a point north of the main Wadi Hadhramaut in 1843, and Halévy on his passage from the Jauf of Yemen to Najran in 1870. Of these only Wellsted can be regarded as geographically reliable, for reasons given by Hogarth. Doughty refers to it in the following terms:

"I never found any Arabian who had aught to tell, even by hearsay, of that dreadful country. Haply it is Nefud with quicksands, which might be entered into and even passed with milch dromedaries in the spring weeks."

Burton and Palgrave (in his paper before this Society) were somewhat less negative, but scarcely less vague, in their reports. Hogarth concludes his chapter on the subject as follows:

"There is reason to think that there is a considerable tract of desert pasture immediately north of Hadramaut, locally called Nejd and roamed by the Kathiri Bedawins, as well as to east of it, held by the Mahra; while similar pastures stretch far to westward of Jabal Akhdar. There, as Miles heard, Awami and Aal Morrah Bedawins rear camels in a steppe diversified by dwarf acacia shrubs, and able to furnish water every three or four days to the travellers, who pass in twenty-five marches between Nejd and the Mahra country."

It has remained for Mr. Thomas to penetrate virtually to the centre of this great arid waste.

On reference to the map it will be seen that Mr. Thomas has demonstrated that the whole coastal area from longitude 51° to 54° is drained inland by a single system of wadis through a vast sandstone steppe, falling from south to north and from west to east. The six wadis all rise at about 3000 feet, three days' march from the coast, and terminate in the sands at a height of not more than 400 feet above sea-level. There is therefore (I make this remark on my own responsibility) a reasonable probability that during the pluvial—of course prehistoric period—the area now occupied by the sands may have been a great inland lake.

In addition to the narrative of his journey, from which I have read extracts to you, Mr. Thomas has collected a number of fossils and rock specimens which are already in the British Museum. On these I will not say more here than that they suffice to indicate with fair accuracy the general nature of the strata traversed. He has also made a useful collection of skins, birds and beasts, great and small, which are now being examined by the experts of the Natural History Museum where his collection will in due course be stored. A skull from an ancient burial ground collected by him has reached England and has been deposited with the Royal Anthropological Institute. Finally, he has collected further data of great interest and value in regard to the tribal and racial problems of this area.

The journey, of which I have given you an outline, together with that of 1928, constitute an achievement of first-class importance in the realm of geographical discovery. They both cover ground hitherto almost wholly unvisited by any European, and unmapped except from the sea. Mr. Thomas's reports are the first authentic record of the nature of a tract of country nearly as large as England, which has been for over a century a subject of active speculation, and of which no sort of record previously existed. It is much that he should have succeeded in making these journeys: it is more that he should have done so in his capacity as the right-hand man of the territorial ruler, H.H. the Sultan of Muscat. It is, above all, creditable that he should have equipped himself so thoroughly for his task as to be able to fix his position from day to day with a sextant, and to collect single handed so much scientific information.

The geographical problems of this part of the Arabian continent are not yet completely solved, but the first and greatest step has been taken towards the final elucidation of the Riddle of the Sands.

The PRESIDENT: We have heard that certain anthropological material has been sent home, including a skull. Professor Seligman is present, and we should be glad if he would comment on this material.

Professor SELIGMAN: The anthropological material actually sent home by Mr Thomas consists of one skull and a series of measurements. Those measurements make it possible to say whether the people he has described are long-headed or short-headed, a point of great interest to anthropologists because the shape of the head is one of the principal criteria of race.

If you will allow me, I must hark back a little to Mr. Thomas's former papers, one read here, the other published in the *Journal* of the Royal Anthropological Institute. In those papers Mr. Thomas dealt with certain tribes from whom he had collected vocabularies. Naturally enough, when he first came back to this country with a number of new dialects, if not new languages, and having travelled among peoples who seemed to him very different from the Arabs he knew, he cherished the hope that these unknown tribes were not Semitic but Hamitic. It was in an endeavour to solve this question that he took the measurements and collected the skull.

All Hamites, we know, are long-headed; almost all the measurements taken by Mr. Thomas prove to be those of round-headed people. As regards the skull, although there is nothing in its anatomy that definitely excludes the possibility of its being Hamitic, the measurements render it exceedingly unlikely that it is so. Considering together the measurements of the skull and the measurements of the living, it can be said fairly definitely that the people are not Hamites, and when the individual measurements are examined and compared with the photographs published—not those seen to-night, because we could not see much of individual characteristics on the screen—it seems obvious that these people, although they speak non-Arabic dialects of Semitic, physically do

not differ greatly from the inhabitants of the Yemen in the opposite corner of Arabia.

As regards the age of the skull, it was found in a bricked-up cave in a rock, a method of burial which, as Mr. Thomas points out, was popular in pre-Muhammadan times, but which is also in use at the present day when a traveller dies and cannot be given orthodox burial. I do not wish to be dogmatic, but the appearance of the skull does not suggest such antiquity as is implied by a pre-Islamic date. I should suppose it to be a fair sample of the present-day population, and, as has been said, its measurements tally very closely with those of the living.

Summing up, I come to the conclusion that these extremely interesting people Mr. Thomas has been among are in fact Southern Arabs, a people who, as far as head shape is concerned, differ from their northern neighbours in that they are predominantly round-headed.

Squadron-Leader C. H. KEITH: Some little while ago I heard that this paper was to be read to-night, and, having been a fellow traveller with Mr. Thomas in Oman in 1927, I asked if I might attend. I did not realize, when the Secretary very kindly agreed to my coming, that I should be asked to speak, and I really do not feel, in the light of what you have heard to-night, that I am in any way qualified to amplify the very able paper to which we have listened.

It happened in 1927 that, after I had acquired a coastal acquaintance of the Persian Gulf and Oman, it became necessary for me to journey across the Oman peninsula. Mr. Thomas was anxious to make this journey and, from his exceptional knowledge of the tribes and country, I was only too glad that he should come with me. In fact, I had no option, because he arranged with the Sultan that this should be a condition of my travelling across Oman. There are one or two small points in connection with such a journey that may interest you and may be appropriate following on this paper, dealing with the technical sides of such a journey rather than with the actual happenings on the journey, of which you have already been told.

As I was going a journey into the unknown, I was particularly concerned with having an accurate knowledge of our whereabouts at the various places at which we stopped. The maps which were available have been compiled largely from information supplied by travellers visiting the country at various dates. In such countries when one asks the distance between two places the reply invariably is given in terms of "camel-days journey," and such would not have been accurate enough for my purpose. When I went down to the Gulf from Baghdad, I tried to get a theodolite, but was unable to do so, so the next best thing appeared to be what I can only describe as "putting a ship ashore," *i.e.* using a navigational sextant and a supply of mercury for an artificial horizon, and taking double-altitude sights of stars and sun. Another problem was to get an accurate knowledge of time. I had in my possession at that time a chronograph watch, which I attempted to rate with the chronometers of the naval ship in which I travelled, but the results were not very happy. Finally I decided to take observations on the time recorded by the chronograph I had with me and to reverse the normal process: instead of receiving wireless time-signals, to broadcast my own inaccurate time in the hope that the ship would receive that and ultimately give me the correct time to check back the sights. Moving in a country where the sun's altitude is high during the day, I found sun sights were practically impossible, and so relied on taking star sights at night. There I was faced with another difficulty: in the evening time the humidity is excessive, and the refraction error of star sights at night an unknown quantity. The only remedy appeared to be to take a number of sights, picking altitudes of about the same value, and not to apply any correction for refraction. As a rough-and-ready method we found this

worked out very well for fixing positions. Mr. Thomas subsequently obtained a sextant and, I believe, has used the same method. The only time we used the sun was when taking compass bearings, when we wanted to determine the local magnetic error.

When I started on that journey I was rather apprehensive as to what might happen in case our camels were stolen, and so I took from India a wireless transmitter, but not a receiver. I did not take the latter because camel transport would have made matters difficult for accumulators and the heat would probably have resulted in dry cells giving trouble. We broadcast from the transmitter and found this a useful means of keeping in touch with the outer world. One thus has an opportunity of saying what is essential without receiving adverse comments.

Before starting on the journey, on the advice of the then Political Resident, I arranged for a medical officer to come with us, to look after the health of those making the journey, to make friends with the tribes by treating their sick, and to collect medical data. On the first score he was very valuable, in that we all got across without sickness. It was part of his duty at every halt to test the water, and as time went on and water became scarcer and scarcer in the open country, his horror at the impurity of it increased.

For treating the tribes and making friends with them, I think the medical officer's services were invaluable. Every time we halted he opened his surgery, and, as his fame spread, the natives used to bring in their most unsavoury halt and maimed, some having travelled considerable distances over the mountains. He worked for hours on end during the sweltering heat of the day, his work being rendered particularly difficult owing to the religion of the natives not allowing them to take anaesthetics. All the surgery was done in cold blood, but their training is such that they never flinched. So great was the doctor's fame that at one place the Shaikh came and asked him to treat his women folk. The doctor came to me very troubled that morning. I sent him off with his instruments in his hands and his heart in his mouth; but he returned safe and sound, having been accorded the privilege of seeing the women unveiled. He told us some were quite beautiful, but this we rather doubted. During that journey the doctor collected a very considerable amount of interesting medical observations and data—the subject of a lengthy report. I am not a medical man, but one point may be of interest. There is a general impression that the native is immune to the effects of malaria. Every case which the doctor examined he found to be suffering from the enlarged malarial spleens, showing, in fact, that the Arab is no more immune to malaria than the white man. He collected a variety of types of malaria mosquito.

I should like, if I may, to record my congratulations to Mr. Thomas on his latest achievement. At the time he journeyed with me his ambition was to penetrate into the Rub' al Khali, the empty quarter. From a personal knowledge of him, I am sure that his determination and his optimism alone carried him through this extremely difficult journey about which we have heard this evening. Travelling in such countries is not an easy matter. As to the journey which I made, I feel certain that, had it not been for Mr. Thomas's expert knowledge of the language and his unfailing optimism, we should never have got across the Oman peninsula. In the past only two white people have ever crossed this peninsula: Zwymer, the American Missionary, in 1896, and Sir Percy Cox in 1902. Mr. Thomas was a very great strength to our expedition. He possesses an amazing determination in the face of difficulties, which is characteristic of the type of Britisher one hopes to find in those countries which have yet to be explored.

Group Captain C. L. COURTNEY (R.A.F.): I am afraid I have no excuse to offer for joining in this hitherto interesting discussion except the fact that the Royal

Air Force are particularly interested in certain parts of the country which have been described this evening. I suppose it has occurred to most of us who keep in touch with current events that the very great difficulties in transport which Mr. Thomas must have encountered on his journey might perhaps in the future give way to modern inventions, and in point of fact I think we are in measurable distance of seeing something of that kind.

The Royal Air Force are interested in the part of the world that Mr. Thomas penetrated because at Aden we have a certain number of aeroplanes, and at Basra, at the head of the Persian Gulf, we have a good many more. It is our intention to try to join these two groups of aircraft by means of an air route which will enable us to reinforce in times of emergency one from the other. With that object in view aircraft from Basra have already reached Ras-el-Hadd, the easternmost point of Arabia, while aircraft from Aden have established a chain of landing-grounds as far as Dhufar. A landing-ground has been established at Salala, the place from which Mr. Thomas started his explorations. From there in April last aircraft penetrated, roughly, 100 miles into the interior and actually came within sight of the extensive desert which was the object of Mr. Thomas's expedition. Needless to say, any protracted exploration by means of aircraft into unknown country has to be very carefully organized. Before anything useful can be done it is necessary to establish advanced landing-grounds with petrol and supplies of all kinds. But when one thinks that within the space of a few hours an aeroplane penetrated from the coast to perhaps within a few miles, for all one knows—I have not any accurate details—of the point that Mr. Thomas arrived at, then one has some indication of what aircraft may be expected to do in the future.

The PRESIDENT: The hour is late, so we had perhaps better bring the discussion to a close. We have listened to the most important communication that we have received on the subject of the great Southern Desert of Arabia. We may not all perhaps fully realize how important that information is and how much Mr. Bertram Thomas did, but I feel sure that those who know best and who have studied the subject will realize that he has given us a valuable communication, and that we owe him a deep debt of gratitude. We owe him also a debt of gratitude for the admirable photographs which he took under difficult conditions. He speaks in the report, which I have had the pleasure of reading, of the difficulty of taking photographs with the sand blowing about. All these things add to the troubles of life in such a country as Arabia.

We must also express our gratitude to His Highness the Sultan of Muscat and Oman for enabling the expedition to take place. We feel greatly obliged to His Highness because without his aid and assistance the journey could not possibly have taken place.

Mr. Thomas, among other things, from time to time fixed his position, and we know that a journey which is taken without positions being fixed in a proper geographical manner is not of as much use as it might be. I was interested in the remarks of Squadron-Leader Keith on broadcasting and fixing the traveller's position by means of signals sent from him.

We owe sincere thanks to Sir Arnold Wilson for his kindness in reading the paper. We are most grateful to him and thank him for the trouble that he has taken.

ALAMUT

W. IVANOW

[*At the especial request of the author we have made no attempt to assimilate the spelling of names in this paper (including the author's name) to the system of the P.C.G.N. Many of the names are spelled phonetically rather than by systematic transcription. We are indebted to Mr. Lawrence Lockhart for permission to reproduce his photographs of Alamut in illustration of Mr. Ivanow's paper and of a note supplementing it which he has himself contributed.*]

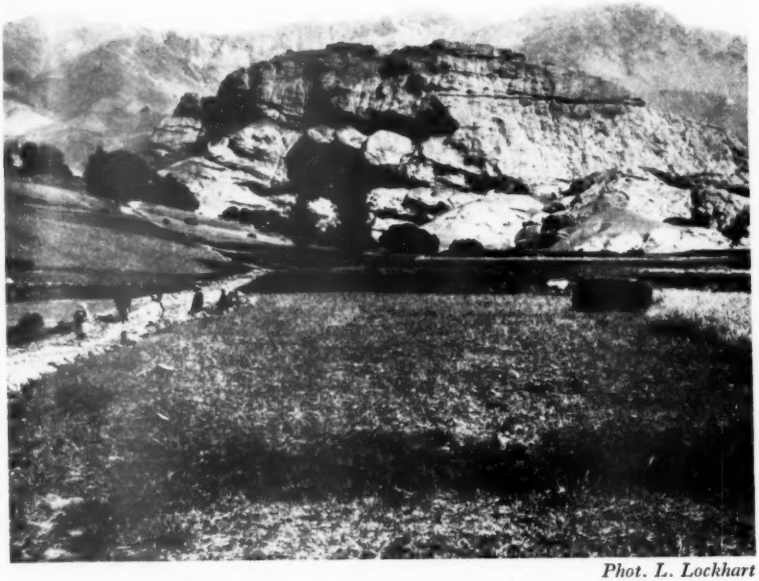
THE name of Alamut is fairly familiar to the Western public. It was applied to the impregnable stronghold of the Grand Master of Assassins, or the "Old man of the mountain" about whom many legends and strange stories were told in the time of the Crusaders and of Marco Polo. During the last half-century the poems of Omar Khayyam, especially in English-speaking countries, made yet another legend popular, viz. the spurious story of Khayyam's school-fellows, who also became great men, *i.e.* Nizamu'l-mulk, the vezier, and Hasan Sabah, the founder of the Ismailite political power in Persia, who made Alamut his headquarters. It is strange to see that despite being so familiar to the public, the place was so rarely visited by travellers and never explored or studied. As far as I can ascertain there is no proper description of the place as it is at present, and the information connected with the real site is not accurate.

The authors writing on matters connected with Alamut usually refer to two early papers, both published in the *Journal* of the Royal Geographical Society: "Itinerary from Tehran to Alamut and Khurremabad in May 1837," by Lieut.-Colonel Justus Shiel (vol. 8, 1838, pp. 430–434), and "Journal of a tour through Azerdbijan and the shores of the Caspian," by Colonel Monteith (vol. 3, 1833, pp. 1–58, especially 15–16). Modern travellers seem to ignore the place completely. Its history is summarized in G. Le Strange's valuable work, 'The lands of the Eastern Caliphate' (Cambridge, 1905, *vide* pp. 220–221); but the statement (based on Colonel Monteith's obvious oversight) that Alamut is situated to the north-west of Kazvin, as well as the map (added after p. 184), in its portions pertaining to Kazvin and the places north of it, are quite erroneous.

The term "Alamut" was apparently applied even very early not only to some particular fortified village, but also to the whole district (*bulūk*),* which formed originally a part of Taliqan.† Its importance was due apparently entirely to its being a strong refuge on the difficult, but shortest, road between the shores of the Caspian, now the district of Tankabun, and the Persian highlands, halfway between Khurramabad and Kazvin. The roads to Alamut are numerous, but

*The system of transliteration adopted here is practically the same as that on the latest maps published by the Survey of India. The long vowels are marked only when this is of importance, and the names already familiar in general literature are left as they are usually given, *e.g.* Kazvin. The names of the local villages are given in a phonetical transcription, to enable the reader in case of a visit to the district to be understood by the local inhabitants. In the colloquial Persian of these districts the long *a* sounds as open *o* (or *a* in English *all*), and *a* short as *ă*. The sound of *u*, short and long, is as that of *oo* in English.

†Cf. Ibn al-Athir, vol. x, p. 215: "and they call this place and its vicinity (the district of) Taliqan."



Phot. L. Lockhart

1. The Rock of Alamut from the south below Gazar Khan

Phot. L. Lockhart

2. Central section of the rock from the south-east, showing transverse wall and diagonal paths

Phot. L. Lockhart

3. Alamut rock from the north, showing the neck joining it to the mountain

on the north the most frequented is that through the Salambar pass. Another path (which was used by J. Shiel), leads across the hills by the Siyalan pass. There are numerous hill paths to Rudbar and Taliqan, but the majority of them can be used only in summer, as in winter they are thickly covered with snow.

The district of Alamut is at present said to contain sixty-six villages. This figure however is probably a round number, and there are not so many inhabited places. It begins just behind the range of mountains which rises north of Kazvin. The villages Simyār, Tānurä, Cholä, etc., which are within a day's march from Kazvin, are already in Alamut. The district has the form of a rhomb, of which the Western sharp angle lies not far from the height marked on the Survey of India map (Persia and Russia, scale 1 : 1 M. Sheet No. 8, Rasht) as 8047, to the north-east of Kazvin, and the eastern corner may be placed somewhere near the sources of the river Shahrud-i-Alamut. According to the map the distance is about 35 miles by straight line. The north-west boundary of the district is formed by some spurs of the main ranges, separating it from the district of Rudbar. The north-east boundary line coincides with the summit of the main range of Elburz, and on the south and south-east lies the district of Taliqan. According to the map, the distance in a straight line from the summit of the range north of Kazvin to the crest of the main chain of Elburz is just over 16 miles. Actually it appears much greater. Alamut is thus formed chiefly by the valley of the Shahrud-i-Alamut to its confluence with the Shahrud-i-Taliqan, with a small portion of the later, and of the great Shahrud, with the adjacent gullies, ravines, and spurs of the ranges.

The streams are rapid and powerful. In the beginning of December there was at their confluence about 3 feet of water at the fordable places. In spring, after heavy rains, and in summer after intense heat which causes rapid melting of snow on the mountains, they swell into terrific torrents, rolling huge boulders along their beds. The beds are levelled, strewn with stones, and cut with zigzags of the ever-changing watercourses, leaving practically no room not only for fields, but even for the road which climbs over the precipice and hangs over the steep and rocky banks. The villages therefore nestle on every low spur, but are usually in the side ravines far up the hill. There is very little arable land which may be irrigated properly, and the greater part of the crops is grown on the fields (*dima*, as they are called here, usually *dayma*, or *dayma-kari*) which depend on rains. These are on the higher smooth slopes of the mountains, just under the spring snow-line, and their produce is small as they are liable to great devastations by rain torrents or drought.

The chief crops are millet (*gāwars*), wheat, and barley. Rice is cultivated in a few places at the bottom of the valleys. Gardens are not numerous, and produce chiefly walnuts which form an important item, with onions, in the food of local peasants. There are not many cattle, and there are no large flocks. The climate is very severe in winter, but hot during summer in the valleys. The peasants are extremely poor, have no local crafts, and often have to work as labourers on rice fields in Mazandaran.

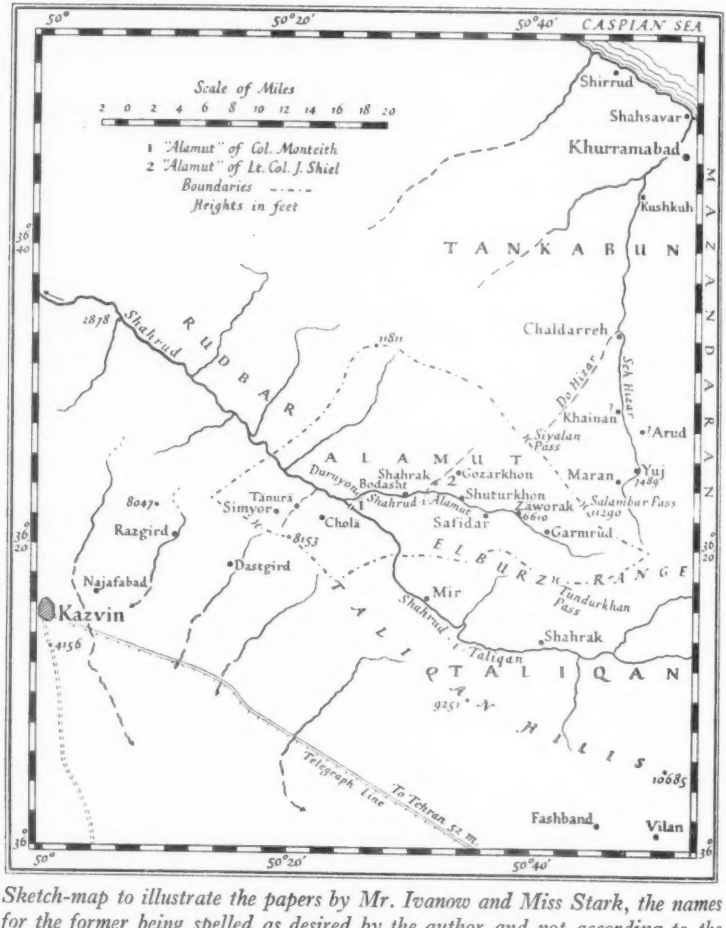
I was assured that the Persian Government contemplates the construction of a road through the district, connecting Kazvin with Khurramabad, which would be passable for pack animals at any time of the year. It may be hoped

3. Alamut rock from the north, showing the neck joining it to the mountain

Phot. L. Lockhart

that this road will raise the prosperity of Alamut; there is however no trace of the beginning of the work.

The population of the district consists chiefly of local Persians, who call themselves Tot (*Tāt*), and a small percentage of Turks, also settled in villages sometimes, as in Shuturkhon, living side by side with Persians. I was assured



Sketch-map to illustrate the papers by Mr. Ivanow and Miss Stark, the names for the former being spelled as desired by the author and not according to the rules of the P.C.G.N.

that there are no nomads and no Kurds, though the latter form a considerable part of the population of Kazvin.

It is difficult, if not impossible, to ascertain whether the present population of Alamut is of ancient origin, and descends directly from the famous race of

Daylamites who have given Persia several dynasties. The natural poverty of the district makes it impossible to think that there was here a great immigration from other parts of Persia. On the contrary, emigration here was rather the rule, and even nowadays many impoverished inhabitants of the district go as labourers to Mazandaran, and even remain there if they find a possibility to settle down. My inquiries as to the presence of new settlers from the interior of the country were invariably replied to in the negative.

The Alamuti peasant, though remarkably enduring, appears much inferior from the point of racial type to Persians from other provinces. There are many traces of degeneration in him, which are due, in the first place, probably to poverty and hardships, and secondly to the vicinity of large cities like Kazvin and Tehran, with their diseases, and also to the admixture of Turkish blood, which everywhere in Persia has a very disastrous influence on the Iranian race.

As scarcely any reliable means may be found of ascertaining how long the present population has occupied Alamut, it remains only to consider their language. With regard to this one may believe that they are really old inhabitants, because of the great variety in their subdialects. It seems that the basis of their local language is the Mazandarani dialect of Persian. But every small group of hamlets has some deviation of its own. There are forms resembling to a great extent those of the Samnani, and besides these, there are always traces of considerable influence of the ordinary "bazari" Persian from the towns. The villages nearer to Kazvin have already lost their dialect, and use the bazari. Such are Simyār, Tänurä, Bodasht, and their neighbours. In Shuturkhon, mentioned above, the dialect is nearer to the Rudbari. In Gozärkhon a special dialect is used which is the same as that of Khushkechol and of Towo (Tābān?), near by. Another group of villages in the vicinity speak a different form of the language, namely in Oton (Ātān?), Känoyä, Ilon, Häniz, and a few others. The village Garmrud, the present administrative centre of the district, up the valley of Shahrud-i-Alamut, with Werk, Hawonak, Hasanobod and Zäworak, use yet a different form. Cholä, Zärdi, and Wärz-i-roh, on the Kazvin side, have also a dialect of their own.*

As in other districts in Persia with a similar accumulation of petty dialectical groups one has to see, in these, signs of the antiquity of the population, because their differentiation is most probably due not to the mixture of different languages, but to the integration or deformation of some original tongue which had to undergo different local influences.

In their style of life and in their dress the Alamutis do not differ from other inhabitants of this corner of Persia, and the influence of the "town civilization" spreads very rapidly over the place. Apparently all the inhabitants are Shi'ites by religion. The question whether or not there survive remnants of the followers of Ismailism, or any other ancient sect which flourished here, cannot

*As far as I can find, these subdialects of the Mazandarani dialect of Persian have never been studied. For the general idea about the Mazandarani see the article by W. Geiger, in his 'Grundriss der Iranischen Philologie,' vol. i, part ii, pp. 344–380. A bibliography is given on pp. 344–346, and there is apparently nothing to add to the list. A paper dealing with the dialect of Gozärkhon, by myself, will shortly appear in *Acta Orientalia*.

be decided without special research.* The impoverished and illiterate peasants are not at home in theological niceties, and the fear of persecution makes them extremely cautious with people whom they cannot take into their confidence. About Ismailite rulers of the place they preserve apparently no memory, and only about Hasan Sabah they tell a few legends which are probably not of local, but of book origin. All those which I heard contained nothing new.

To get to Alamut one leaves Kazvin and its gardens on the north-east side, and, after four hours' riding up the gently sloping plain, reaches the entrance of the gorge leading to the pass. There are several villages along the road, such as Najafabad, Dastgird, and already at the foot of the hills—Razgird (Rāzigird on the map). On entering the gorge the path takes the northern direction, and, leaving the path to Rudbar on the west, turns to the east, and begins to ascend a steep rocky spur of the main range. It takes about four hours to reach the top of the pass, allowing for a short rest. A steep descent along another spur leads to the hamlet Tänurä, in a deep rocky gorge. The village Simyār (not Simiyār, as on the map), with a few others, remains on the left in an adjacent gorge, more to the west.

Crossing the gorge to the next eastern spur of the range the path continues along it, and then begins an awkward descent (apparently quite impassable after heavy rain or snow), to the stream of Shahrud-i-Taliqan, only half a mile above its confluence with Shahrud-i-Alamut. Before the beginning of the steepest part of this descent the path is joined by another, which leads to Cholä, and from there also comes to Kazvin. This road is easier than that of Tänurä, but considerably longer. The right bank of the Shahrud-i-Taliqan on the path down is steep rock, but on the left there are some level places with gardens. There is a bridge across the river shown on the map. In reality it is of no use whatever. It is a frail structure of thin poles, on which only one man at a time may cross the stream with great caution. There is no question of using this bridge for animals.

The path descends into the river, and one enters the narrow passage, cut through the hills by the stream, Shahrud-i-Alamut, a narrow corridor between two walls of rock. The place is called Duruyon, probably for Dū-rūdān, *i.e.* "two rivers." It is about a quarter of a mile long, and broadens afterwards into the valley of Alamut. The current is rapid and the water muddy. The path climbs up the steep left bank of the river, and after about 3 miles crosses the bed of the river to the right bank where the village Bodasht (Bāgh-i-Dasht) is situated. From this place the path follows the right bank, and in about an hour reaches the village Shahrak (not Shāhrak, as on the map) and afterwards, in again about an hour, Shuturkhon, which is situated on the slopes at the mouth of the Gozärkhon ravine. Here the path ascends the flattened slopes of the main range, which are covered with *dima* fields, and then, re-crossing the same ravine, one arrives at the village Gozärkhon, at the foot of the famous rock of Alamut, as identified by Shiel.

The latter is a huge piece of a conglomerate layer which was broken off and

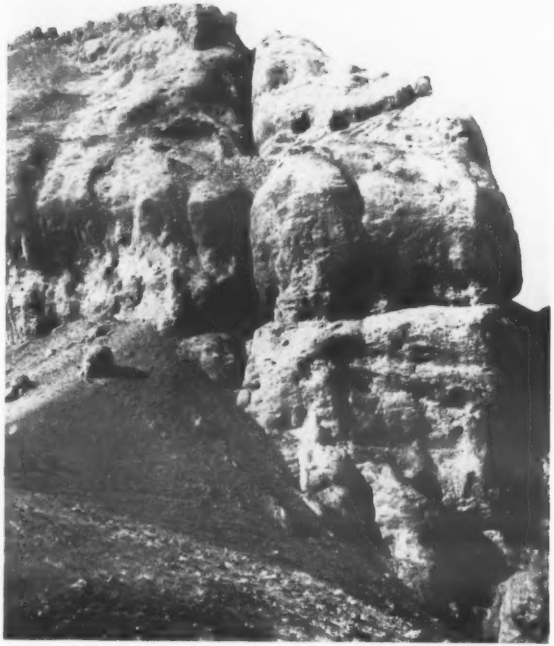
*Mustawfi Qazwini, in his 'Nuzhatu'l-qulub,' p. 61, speaks not only about the Ismailites living here (probably themselves belonging to different sects), but also about the so-called Maraghiyan, *i.e.* Mazdakites, the followers of the heretic Mazdak, who found quite a large following in Adherbayjan.

Phot. L. Lockhart

4. Looking south-south-east from the rock: village of Gazar Khan in the foreground

Phot. L. Lockhart

5. North-west end of the rock, showing troughs with vine growing in upper of two on right



Phot. L. Lockhart

6. The rock from the neck, showing chimney blocked by masonry

lifted into almost a standing position by volcanic action. It rests on the northern side on the foot of the mountain near which it is situated, and only from this side may it be ascended without special implements for climbing. In the vicinity are rounded sloped hills, of some soft formations, chiefly derived from the erosion of conglomerates. They are all cut in various directions by deep ravines, with almost vertically rising banks. At the bottom there are occasionally insignificant streams which become torrents after every considerable rain.

The history of the famous fortress of Alamut begins very early. It existed as a fortified place before 860 A.D., when it was rebuilt by the Shi'ite missionary, Hasan, called ad-dā'i ilā'l-Haqq. Hasan Sabah took possession of it about the year 1090 A.D., and it was dismantled by order of Hulagu the Mongol in 1256 A.D. after his suppression of the Assassins. It was however rebuilt, entirely or partly, later on, and was used as a state prison in the seventeenth and eighteenth centuries during the reign of the Safawide kings of Persia. But Alamut, which was considered as the principal fortress of the Assassins, was only one of a large number of fortified places in the district. Persian historians state their number as about fifty. Probably they were not really castles in the mediaeval European sense of the term.

The mediaeval European castle was the residence of a warlike lord of the district, who was the owner of several villages inhabited by peaceful and unarmed folk. It was on the produce of their labours that the armed rulers could subsist. In a poor district like that of Alamut, where nowadays thirty villages cannot subsist by themselves alone, it would be impossible to expect fifty castles in addition, with strong garrisons. The term "castle" is a very unhappy rendering of the original term *qal'a*, which means simply, and first of all, a fortified village or town, as well as a specially fortified refuge, used in the time of danger, and left unoccupied in ordinary times.

The best authority on these places as they were in the thirteenth and fourteenth centuries of our era is undoubtedly Hamdu'l-lah ibn Abi Bakr Mustawfi Qazwini, who was a native of Kazvin, which, as we have seen, lies only a day's march from the district of Alamut. In his famous works, the historical 'Ta'rikh-i-guzida,'* and geographical 'Nuzhatu'l-qulub,'† composed about 1330 A.D., he gives interesting information. According to him ('Nuzhatu'l-qulub,' p. 61), there were nearly fifty strongly fortified places, and the strongest (as he says, the "best") of these were Alamut, Maymun-diz, and Lambasar. To these apparently must be added Gird-i-kuh. Both Yaqut (II, 156) and Ibn al-Athir (XII, 264), speaking about the Ismailite rulers, call them the "owners (*sāhib*) of Alamut and Gird-i-kuh." According to Mustawfi Qazwini other places were: Sarush (?), Sarchah (=Cholä ?), Dizak, Nayyira (Tanura ?), Bahram-diz, Ahan-kuh,‡ Zawran (?),§ Taj, Shayharan (or Shiheran), Firdaus, Mansuriyya (or Firdaus-i-Mansuriyya), etc.

*Gibb Memorial Series, vol. xiv, 1911, edited by E. G. Browne.

†Vol. xxiii in the same series, the text, 1915, edited by G. Le Strange.

‡This name may be read also as Ahankara. It is interesting that the inhabitants of Gozärkhon assured me that their village was formerly called Ohängälor, which may be a corruption of Ahangara; or it may be a Turkish equivalent for it, Ahangar-lar (which means "black-smiths").

§The strange appearance of the Arabic letter *dād* in the name of a Persian village

6. The rock from the neck, showing chimney blocked by masonry

5. North-west end of the rock, showing troughs with vine growing in upper of two on right

There is no indication of the position of all these places. Only one name, besides Alamut, survives apparently in a corrupted form, *i.e.* Lambasar, which may be recognized in the name of the peak and the pass of Salambar (11,290 feet). The fortress most probably guarded this important pass, opening the road to the Caspian, and its ruins must be sought somewhere in the vicinity of it. Perhaps Shiharan or Siharan may be recognized in Siyalan; it is also the name of a pass, westwards from the preceding one.

The general position of Alamut is regarded as being quite certain, on the authority of Monteith and Shiel, in their papers in this *Journal*, referred to above, but both these accounts are so brief that only a personal acquaintance with the locality makes it obvious that the authors are speaking about two quite different sites. Shiel's Alamut is near the village of Gozärkhon (not Gaser Khani, as he writes), and is so called by the local inhabitants. Monteith's Alamut is obviously at the confluence of two Shahruds near Duruyon, on a hill range which is a continuation of the main Elburz chain. A path leading to it begins halfway between the corridor mentioned above, and the village Bodasht. Colonel Monteith gives the name of the place near the confluence of the rivers as Jirandey, but this may be a rationalization of the strangely sounding name into the "village of jeyran," *i.e.* deer. The deer is generally regarded by Persian peasants as an unlucky animal, and therefore it seems rather doubtful that a village could have such a name.

As to the problem whether the fortress of Alamut was really one of these two, and if so, which of the two ruins can be identified with it, I doubt whether it can be decided without special excavations and a careful study of the whole of the district.

The ruins near Duruyon are on the top of a hill with very steep slopes. The wall encircles the top, and there are traces of extensive buildings, staircases, etc. Colonel Monteith gives quite a vivid description of them. The ruins near Gozärkhon, described by Shiel, on the conglomerate rock mentioned above, are not so extensive. There are traces of brick walls, but they are preserved only in quite inaccessible places over the precipices and were probably taken to pieces and removed for private needs by the local inhabitants. The remnants of walls which are still visible on the top are all made of rough stone joined by white lime mortar, quite hard by itself, but not adhering well to the stone; the place is covered with pieces of it. There is nothing to surmise about the plan of the fortress as it was in its better days. It is interesting to note some oblong rectangular holes a few feet long that are found in the rock. They certainly could not be cellars or cells, being too small for this, but probably were made for the foundations, wooden or otherwise, of different superstructures, because there is not much room on the top for ordinary buildings. The place is covered with pieces of pottery. Many are glazed and coloured. Some belong to cups and bowls obviously imitating the blue and white Chinese designs of the Ming dynasty, which became known to Persia in the seventeenth century. Thus it is possible to think that the place was still inhabited probably as late as the eighteenth century. This fits in well with Chardin's statement about the fortress being used as a prison under the last Sefevides.

makes it obvious that there is a mistake. As it is, the name resembles Zawārak, the name of a large village near Garmrud.

The place must have been really impregnable for ancient arms, as the rocks are extremely steep or overhang the precipice on almost every side, and the entrance could easily be fortified. There are, besides, numerous deep ravines which would make manoeuvring of troops extremely difficult. But, on the other hand, the top of the rock could scarcely accommodate more than a couple of hundred of men with their supplies for a long siege. And, as usual in all such hill castles, there is no water supply. The local inhabitants have many tales as to hidden springs, but these are an obvious fallacy.

So the question about the real situation of the headquarters of Hasan Sabah cannot be answered properly, at least at present. The information given by historians contains very few details which can help to pronounce in favour of a particular locality.

Shiel mentions in his paper some graves near the ruin. Unfortunately his statements are so vague that it is absolutely impossible to see in what direction they may be sought for. My inquiries on the spot were quite fruitless. Just below the rock and the village of Gozärkhon there are extensive traces of some old habitation. The houses were built apparently in the same way as they are constructed in the district now, *i.e.* of rough stone laid in clay. When rain washes away the clay, and the walls fall down, regular heaps of them are to be seen on the ground. On one side of the place occupied with these heaps of stones, there is a small whitewashed building with a wooden door. The local inhabitants call it the shrine of an "*imām-zāda*," *i.e.* a descendant of Ali, son-in-law of Muhammad. His name is forgotten. As the rulers of Alamut, the Ismaili Imams, were also the descendants of Ali, it is quite possible that the place venerated by tradition may be a grave of an Ismaili saint. On the other hand, it is difficult to believe that it could remain undesecrated and undisturbed by persecutors. The local cemetery of Gozärkhon is quite modern, very poor, and contains no inscriptions which could be of any historic value.

It is difficult to collect any information as to ancient ruins without paying a personal visit to different parts of the district. Local inhabitants take no interest whatever in such matters, and as they have very small flocks, shepherds, who are usually invaluable for such inquiries, are rare amongst them. I visited the place in the beginning of December 1928, with the intention of ascertaining, if possible, the real site of the stronghold of Alamut, but had only a very limited time at my disposal. Winter is not a proper time for a tour here, because rains and snow often render the paths so slippery that, besides being dangerous, they require too much time even for easy marches.

Owing to bad weather I was unable to photograph the ruins at Duruyon, but the rock of Gozärkhon was photographed by me in about fifty places. Copies of some of these views are deposited with the Society.

SOME NOTES ON ALAMUT

LAWRENCE LOCKHART

MR. IVANOW, in his paper on Alamut printed above, states that "modern travellers seem to ignore the place completely." Actually however Professor Herzfeld had visited Alamut in 1927 and the late Captain Eccles, Mr. J. T. Henderson, and I were there in July 1928, thus a few months before Mr. Ivanow himself. So far as I am aware, Professor Herzfeld has not published any account of his journey to Alamut, which he described to me on his return to Tehran, but a description of our visit, by the late Captain Eccles, appeared in the *Journal of the Central Asian Society* (vol. 16, part iii, 1929), and I have contributed articles on the subject to *Asia* (November 1929), and the Bulletin of the School of Oriental Studies (vol. v, part iv, 1930). These accounts do not appear to have reached Mr. Ivanow before he passed the proof of his paper for press. And now a most interesting description by Miss Freya Stark of a journey made by her in May 1930 through the Alamut valley and over the Salambar Pass is being published in this number of the *Journal*, following this note.

Professor Herzfeld, like Colonel Shiel in 1837, travelled by the arduous mountain route *via* Karaj and the headwaters of the Shahrud. Mr. Ivanow, on the other hand, using Kazvin as his base, took the relatively easier way *via* the Simiar Pass, just as my companions and I had done in the summer of the same year. Mr. Ivanow's impressions are therefore of particular interest to me, but I find some difficulty in recognizing certain of the place-names in the form in which they appear in his article. Simiar, for example, is given as Simyār; Gazar Khan appears as Gozärkhon, Shutur Khan as Shuturkhon, etc. This unusual spelling is explained by Mr. Ivanow in a footnote on p. 38 as phonetic. I did not myself notice any tendency on the part of the people of the Alamut district to alter their vowels in this manner. I therefore venture to think that a visitor would make himself more readily understood if he pronounced the vowel sounds in the usual way. Also Mr. Ivanow's method of transcription does not seem to me consistent, nor to be based on any generally accepted system of phonetics. In my opinion he would have done better to follow the system of transliteration accepted by the P.C.G.N. Every one would admit that the existing maps of the Alamut district are very defective, that many places are omitted altogether, and that those that are marked are often spelled wrong and are sometimes in the wrong position—for example, Alamut itself, with regard to the true position of which I agree with Mr. Ivanow, namely, that it is 36 miles in a direct line north-north-east of Kazvin. I estimated the distance by the mule track *via* the Simiar Pass, Simiar village, the Alamut Gorge, and Shutur Khan as about 50 miles; it took us two and a quarter days to reach Alamut from Kazvin. According to my aneroid, the top of the rock is 6200 feet above sea-level.

Mr. Ivanow states that the Gorge of Alamut is only a quarter of a mile in length. I should say that it is quite a mile long, if not more. His remark could only apply to the very narrowest part. It certainly seemed a long distance to us when we traversed it, perched precariously on our stumbling mules as they laboured along against the strong current, often almost entirely submerged!

Our guide made no mention of the other route followed by Miss Stark, so we imagined that, unless we made a long détour, there was no alternative to the gorge.

The surprising feature of Mr. Ivanow's article is that he is in doubt as to whether the site of Alamut is on the top of the precipitous rock near Gazar Khan or on the hill near Duruyan. To my mind, there can be no doubt whatever that the site near Gazar Khan is the true one. Professor Herzfeld (who is a recognized authority) was positive as to this when describing his Alamut expedition to me on his return to Tehran.

As to the ruins of the fortress itself, Mr. Ivanow goes rather too far when he says that "there is nothing to surmise about the plan of the fortress as it was in its better days." It is true that the place is in a terribly dilapidated condition, but one can still get a rough idea of the general plan. In shape, the top of the ridge may be likened to a ship, being divided naturally into three sections by transverse depressions several feet in depth and width. The "midships" portion was evidently the principal one, as it is the widest (about 35 yards at the broadest point) and contains the most extensive remains. The villagers informed us that the ruins had suffered much during the last fifty years at the hands of treasure seekers. A wall which is still in a fair state of preservation runs right across the rock at the south-eastern extremity of this central section, being built up from the bottom of the gap separating it from the "stern" or end portion to the south-south-east. There are traces of a similar wall at the other end of the central section; this suggests that it may have been used as a kind of citadel. The remains of these walls are shown in my photographs (Plates 2 and 6).

Mr. Ivanow speaks of the "traces of brick walls . . . preserved only in quite inaccessible places over the precipices." Not without some difficulty, I climbed down from the central section for some 40 or 50 feet on the south-west side, and there found the remains of a strongly built brick wall that had apparently run parallel with the top for a considerable distance. As the rock was too steep below this wall for assailants—or any one else for that matter—to attempt to scale it, I came to the conclusion that this wall had not been used for defensive purposes, but had, by serving as a retaining wall, considerably added to the area of the fortress. Moreover, the space between this wall and the rock, if roofed over instead of being filled in with débris, would have provided room for storehouses and cellars, and possibly living quarters as well. All this however is mere conjecture.

Mr. Ivanow mentions the oblong rectangular holes on the face of the rock near the north-north-west end, and surmises that these may have been made for the foundations of superstructures. This may well have been the case, as they are more or less on a level with the remains of the brick wall to which I have referred above. One of the holes however may have been used as a reservoir, since it is much deeper than the others, and the smooth sloping face of the rock above constitutes an excellent catchment area. This hole was more than half full of water at the time of our visit. In the next hole is a vine which the villagers of Gazar Khan assured us had been planted by Hasan-i-Sabbah himself! These holes are shown in my photograph (Plate 5).

I noticed two other reservoirs, both nearly full, cut into the face of the rock.

These were both on the other, or north-east, side. I also found a number of small tunnels or cellars. On the north-east side, close to the north-north-west end of the rock, is a natural "chimney" which has been carefully blocked up by masonry (see Plate 4). To judge from the amount of broken pottery lying about on the neck connecting the Rock of Alamut with the mountain side, a considerable village must once have stood there. No trace of any buildings however remains.

In one respect both Mr. Ivanow and Miss Stark fared better than my companions and myself. When we first arrived at Shutur Khan on our way to Alamut, we were received with marked coldness, verging on actual hostility. We were at a loss to account for this most unusual attitude on the part of the villagers until we discovered that they had mistaken us for some conscription officials who were then touring the district. Once the villagers found that we were not going to conscript them, but were merely "Firangis," they received us with the kindness and hospitality usual in those parts, and the Kadkhuda insisted on acting (gratis) as our guide as far as Gazan Khan, where he introduced us to the village elders. At Gazan Khan we also met the real conscription officials, and then sat down under the shadow of some plane trees to a sumptuous lunch, in company with the village elders, the officials, and our friend the Kadkhuda of Shutur Khan.

THE ASSASSINS' VALLEY AND THE SALAMBAR PASS

FREYA STARK

THE Alamut valley, which is north-east of Kazvin in North Persia, not only looked attractive on the map, but interested me because of its connection with the Assassins of the twelfth and thirteenth centuries, and I rode there from Kazvin in the latter half of May of this year. As this part of the country has been recently visited and described both by the late Captain Eccles* and Mr. L. Lockhart,† I will not linger over it—though my route differed slightly from theirs—but will begin from Shutur Khan, the most easterly point reached by them, to describe the rest of my way across the Salambar Pass to the Caspian shore at Shahsavar.

The country, from the trough of the Sefid Rud in the west, tilts upward and eastward to the great massif of the Elburz peak and the semicircle of mountains, Tundurkhan, Nazar Kuh, Takht-i-Sulaiman, which run in a northerly direction from the main Elburz range. The northern wall of the Alamut valley attaches itself to this chain through Mount Narghiz, east of the Salambar, and consists of a series of summits, Kuchinan, Khoshechal, Haudegan (lower and more southerly than the others), and Siyalan near the pass of that name. Of all these, though the country is well surveyed, Takht-i-Sulaiman alone was

*_Journal of the Central Asian Society_, vol. 16, part iii, 1929.
†London School of Oriental Studies, _Bulletin_, vol. v, part iv, 1930.

named on my map, nor was Elburz himself, with his five subsidiary points, marked by name, although the range is called after him.

Our mules took us to Dastgird from Kazvin in five hours; thence, next day, across the Chala pass to Chala village. From here, in early morning, we followed the little torrent in a sharp descent, dodged a landslide on our right, and climbing down a steep crest, came to where the two streams of Alamut and Talaqan, now in full spate, met and became the Shahrud river. This place is called Shirkuh, and is the western "gate" of the Assassins' valley: the flooded Alamut, rushing between high cliffs of steeply tilted reddish strata, fills the entrance from side to side. Close to the turmoil of rock and water is a small flat stretch of peaceful ground with two huts, and wheat, sycamore trees, and briar roses bending over the stream: and the track crosses the Talaqan on a wooden bridge built in place of the old one of brick, of which the foundations are yet visible.

Here I came into the route of my predecessors, who reached this place in July, when the water was lower, and were able to wade upstream under the impression that there was no other way. There is however a well-marked steep path which takes off from the Talaqan track and, after climbing over the top of the cliff, descends again beyond the "gate" to the Alamut stream. This is the key to the old strategic disposition of the valley, for the Assassins had a fortress to hold the western entrance at the highest point, just as another fortress within sight on the east held the other "gate" of Garmarud. The whole valley, with its central keep at Qazr Khan, was a vast fortified stronghold. Unfortunately, I only heard of this first castle when I had already passed beyond it, and the suspicions of local authority made it impossible to retrace my steps. It is probably not more than a heap of stones, with seven old tanks—so it was reported—and traces of an arrangement for getting water across from the Chala slopes. The details should be taken tentatively as native hearsay, but its actual existence was given me several times on good authority, and it must be looked for to the right of the track near its summit.

There is nothing new to be said about the Assassins, and their interest is not strictly geographical. But they made our chief conversation through the Alamut valley, and were my reason for being there at all, and so I will remind my readers how their founder, Hasan-i-Sabbah of Rei, a young man with apparently no advantages except his own ambition and a training in philosophy, decided to become a power in his own world and time, and invented and organized his ingenious system of murder. After a varied youth spent partly at the Persian Court, partly in Isfahan, Egypt, and Syria, he preached his doctrines and began to gather adherents round Kazvin, and in A.D. 1090, when about thirty-eight years of age, having visited Alamut and noticed the extraordinary strength of the position, he obtained it by guile or treaty, and kept it as his chief stronghold. His descendants and followers remained there till they were swept away by the advancing Mongols in 1256.

How their influence spread, and the terror of their name; how they came into contact with the lords of Syria and the Crusaders and the Templars in the West; how their young men, drugged with hashish, were taken and given to taste of paradise in some secret garden of this valley, so that they might the more wholeheartedly devote themselves to their business of assassination, has all

been told by numerous travellers. But the very truth of the matter is still unknown; its secret was lost when they burnt the great library on the Rock of Alamut. Whether here was merely some ill-digested patchwork of creeds, such as those of Ismaili, Nosairi, Druzes, and kindred sects; or whether some glimmer of the ancient freedom, some light of philosophy brought down from Greece through Egypt, lingered in this last hold, it is now impossible to determine. The legend of the garden also has left no clue. But some of the names which used to distinguish the order still live on: the title of Da'i, which corresponded to the Prior of the Templars, and was heard in Resht by Fraser in 1822, applied there to the Governor's uncle; and the name of the actual Assassins, the Fida'is, was applied during the war to the irregular native levies enlisted in North Persia by the British.

As, three hours beyond Chala village, you breast the height above Shirkuh and see the many ribbons of the Alamut water in their flat bed below, it is difficult to imagine a more romantic view than that of the Assassins' valley. On the north is a desolate little side valley called Gurgdar (place of wolves) in a chaos of small hills and gullies of hardened red earth, the typical waterless uninhabited landscape of Rudbar. On the south, all overgrown with shrubs and trees, hawthorn, yellow jasmine-like blossoms, and pink roses, or white-petalled ones larger than ours, the steep mountain-side rises in precipitous slabs of grey rock, and continues like a wall along the stream, only broken east of Shahrak, where tracks from Dodeksar and Mahmudabad lead across to the Nazevar pass and the Talaqan country.

The northern side of the valley is much shallower. Between its outer shell of hard rock—the ridge through Mounts Kuchinan to Siyalan—and the river, there is, as it were, a lining of red earth, sometimes hardened into cliff, sometimes formed into a system of hills within the bigger system, sometimes sloping in long ridges like glacier moraines scored into steep channels by the streams. And these in themselves show the difference of soil, for while the Alamut and its shorter tributaries carry the red earth in muddy waves, the farther streams which come from the rocky outer rim of the valley bring clear foaming water. These streams lead up to the passes. There is one at Shahrak, the Kuchinan Rud, near whose headwaters are four villages, Sankalariyeh, Kandanesar, Andaj, and Kuchinan, and tracks that go over the shoulders of Mount Kuchinan to the Caspian at Shirrud by Lagpashan, Limra, and Qalamvar. These I could not locate except very vaguely. The Siyalan, the next pass, also has easy approaches west and east of Mount Haudegan through the villages of Tuwan and Atun: but the pass itself is not negotiable in winter, and indeed none of these more westerly routes can compare in importance with the Salambar and its continuation, the Tundurkhan, across the Elburz range, for these are both (usually) practicable all the year round, and carry much of the Caspian rice to Tehran and inner Persia.

At Shutur Khan I spent two days as a guest of the Arbab, the owner of this neighbourhood. From his house I could see the Rock of Alamut itself, a great mass of smooth stone 3000 feet above us, jutting out from the wrinkled slope of Mount Haudegan behind it. I walked up to it across flowering wild meadows whence the peaks of Elburz begin to show as a snowy wave in the south-east, behind the lower hills. Among the stones and poor remnants of wall on the

great rock, red and yellow tulips now grow everywhere; and a vine digs its roots into the old tank on the western face, where the barefoot village children pick black grapes of a kind unknown, they say, in the valley. We stood, as it were, at cross roads, for from our height above the southern face, too steep for any but a mountaineer, we looked down along the Qazr Rud to the Alamut valley and the Mahmudabad gap beyond, and south-west across arid slopes now clothed with grass to Shirkuh and its fortress, while at our back we could command the tracks to Siyalan. From here the Sheikh of the Mountain held men in his power even to the Mediterranean coasts, and there must have been much traffic in this forgotten landscape, up and down the path by the Qazr Rud, where now in the long afternoon light we descended, and listened to Ismail as he strode ahead and sang his peasant ballads in the three-rhymed quatrains of Omar.

At Shutur Khan I came into collision with the police, an engaging young man whom here they call "The Government." This is an accurate description in a district where there is neither doctor, chemist, nor Government school, and where posts no longer exist since "two postmen died." The young man told me that he was in sole control of the 15,000 inhabitants of Alamut and Rudbar, who "all quarrel," said he, "and my hair grows grey." He set himself in a bright transparent way to wring my secrets from me: asked me for my map, took my refusal in good part, and was pleased with the rather peculiar substitute of a tube of tooth paste. This is all the bribery I have been guilty of in Persia, or indeed anywhere else: but I could see that mediaeval history was not considered a very plausible excuse, and decided not to puzzle him twice over by returning to Shirkuh. I have often noticed that the official mind, like thin ice not necessarily frozen over a great depth, can be crossed once, but should not be subjected to repeated pressure.

Next morning we left on a five-and-a-half-hours' stage for Garmarud, along the northern bank of the Alamut. I had three mules, 'Aziz my charvardar, and Ismail his man, and I rode comfortably but inelegantly on a quilt on top of the pack saddle, a native fashion particularly adapted to mountain paths, for it allows one to alter one's position and jolts far less than more orthodox arrangements. I had not asked for Ismail and his mule, and they were not included in the two tomans (6*s*.) which I paid 'Aziz daily for himself, his animals, and all our food; over and above this I used to give three krans or so to my hostess after a night's lodging in the villages, and found that it made every one happy without placing me in the isolated position of the rich, who lose the fun of travel. As for food, I had an unnecessary amount of tinned stuff, in view of the blank spaces on my map and the supposed difficulty of the jungle people; but we were never out of reach of very friendly villages, and I think that even in the more unknown valleys east of Salambar there would be no need to carry much provided one had a guide who knew the inhabitants, and unless it were for actual climbing which carries one above the height line of the shepherd camps.

After Shutur Khan the valley becomes gradually narrower but also more continuously green, village touching village in places, with deep cool fields of corn, great mulberries and walnut trees, and tall hedges trailing vines and wild roses. Cuckoo voices in the glens and the scent of hawthorn were like May in England. The most fertile land was with us on the northern bank, and after Haranek we came to the rice-growing villages, Khoshgedar and Yarafi, where

the Atun Rud comes roaring down from the western heights of Siyalan. This was like a lake country, and the watery rice beds, as yet unplanted, lay in shallow terraces with a little portcullis of bamboo sticks at the gap between them to filter the water as it trickled through. The places on the river, from Badasht to Zavarak, grow rice and corn in alternate years: above this level the rice will not grow, and the people's health is noticeably better. I was called again and again to look at sick folk for whom, even had I the knowledge, nothing could be done. Quinine, which is used even among the Badawin, seemed to be unknown here, and I begged 'Aziz to import some from Kazvin, and left what little I could spare, for the mosquitoes, though not supposed to be dangerous till June, were already numerous near the water.

The best track had been washed away, and we climbed, with all the valley spread below us, in places where the path dwindled to the exact breadth of one hoof, and even Ismail looked anxiously down the crumbling red slope to the river. On the opposite bank was Safidar, with Mount Siahsang above it, the first and lowest of the Elburz massif we were now approaching. A few cedars dotted its flanks, and the valley took a turn north-eastward to avoid the long moraine-like ridges outspreading from its base. In this upper part of the valley the southern bank branches out into glens which lead to the snowy Elburz peaks, and Zivarchal and Khoshechal (another of that name) appear at the heads of green valleys. "Chal" means a hollow place, and must, I think, be the same word as the colloquial 'Iraq Arabic "chol" for desert. On the northern side we were gradually being hemmed in by an immense rocky wall on one of whose spurs far ahead they told me was the third castle of the Assassins, where according to the legend 'Ali besieged Shah Nevisar long ago.

We came to Zavarak, the largest village of the Alamut region, which is shadowed by the most beautiful trees of the valley, and boasts furthermore one of the two shops. The other belongs to 'Aziz in Garmarud. As we turned a corner, he pointed to his village before us, a hive of flat roofs pressed against a mighty wall of cliff now lit by the evening sun. This is the eastern "gate" of the valley, where the Alamut enters through a gorge even wilder and narrower than the western at Shirkuh. The castle of Nevisar Shah stands on a pyramid of rock 3000 feet above it.

'Aziz promised to find me a guide next day. Meanwhile our mules, knowing themselves at home, climbed on their own account down the narrow street, where their packs brush the houses on either hand, while we loitered to greet friends on their house roofs, and to admire the little three-sided box of a shop with almonds and raisins, nails, rope, shoes, and paraffin crowded on its shelves; and so came slowly to 'Aziz's house by the stream.

The people of Garmarud have a reputation for intelligence, and they looked smart and prosperous. Indeed, all the Alamut valley seems better clothed and furnished than the hills north and south of it. I sat in 'Aziz's best room, on a home-woven mat, with felt rugs spread around. These are cunningly beaten out so that there are three or even more layers of felt on the outer edge and only one in the centre, with patterns in red, white, and black on a grey ground, and they are native to Mazanderan. Near the door, striped woollen stuff for trousers was being woven on a small loom. 'Aziz's mother, who had been my travelling companion to Shutur Khan and had come on the day before, had

evidently given me a good character in the village, and welcomed me affectionately, while the pretty wife bustled round with a baby tied to her back. The women's dress here was at its best, with dark trousers, and frilled cotton skirt to the knee, and a masculine shirt and parti-coloured waistcoat loose over it. They do not wear the chadur except very perfunctorily, but they bring a red cotton kerchief from the back of the head, twist it over the forehead, and tuck the ends in again at the neck. Their big shawl they wrap round their waist in a triangle with the points dangling behind, and tuck their babies into it at the back. There was no record here of European travellers except for a party twenty years ago which the older men of the village remembered. No stranger, said they, had climbed to Nevisar Shah. The village dyer however knew the way, for he was a shikari for ibex, and next morning he appeared with enormous hands still blue from the vats, an ancient pair of glasses, and an old muzzle-loader 6 feet long.

The castle stands at about 10,300 feet, nearly 3000 feet above Garmarud, according to my not too reliable aneroid. Mules can go up halfway, north-west, by a very steep track to a green col at the foot of the rocky pyramid itself. Here we came upon what had once been a burial ground, with traces of five or six shallow graves lying north and south, all rifled. Jewels and swords had been found, but all taken to "the town" and sold over a generation ago. "It did not matter; they were Unbelievers," said my guide, thinking that I mourned over the sacrilege. When he realized that what I regretted was the loot, he promised to show me a jewel brought to him as a boy by his father, and which he thought very ancient and valuable. Leaving Ismail and the mules at this place, which I called the Neck of Graves, we began to climb. It was good rock-work, and I was glad of my cotton-soled native shoes. I was told afterwards that the village had bets as to whether I would reach the top or no. The approach seems equally precipitous on all sides: there was no trace of even the one way down, where 'Ali is said to have placed his guards when the Shah and his son, conveniently transformed into a ram and a black dog, trotted through unperceived. I thought I could see a sort of ledge and rift in the southern face where a narrow walk might have been built up with masonry, but it is much steeper than the Rock of Alamut; the space built over at the top is also much greater, and divided by a dip into two portions, of which the south-eastern, covered with indistinguishable heaps of debris, looks like the remains of a small hamlet, while the higher rock held the fortress itself. A bit of the outer rampart, two walls with a walking space between them and holes for rafters which probably roofed it in, still stands below the summit on the south; and at the very top there are a few bits of wall, with an arrow slit, all built of rough stone, and mortar for which the lime could be quarried in a white hillside opposite, across a deep drop on the north.

Here, as at Alamut, there were shards of pottery among the stones; and I collected a handful and, keeping them carefully distinct, showed them to Mr. Hobson at the British Museum when I returned to England. The Alamut pieces belong to two distinct periods, while those of Nevisar Shah must all be dated back to the days of the Assassins. It would seem that this stronghold was destroyed by the Mongols and never more inhabited. Some of the early pieces from the two castles were identical in pattern and colour.

I think it is evident that this castle is the one mentioned by Marco Polo, and that the cliff of Garmarud is one of the "lofty mountains" of which he speaks, while that of Shirkuh must be the other. The two defiles are so striking both because of their similarity and because of their position at the two extremities of the valley that any one trying to describe the place would hit upon them as the obvious landmarks. The use of the word *mountain* for what should be translated as a *defile* in English is not uncommon in the early Italian writers, who think of altitude in terms of depth as well as height.

This is how Marco Polo describes the Assassin chief and his abode:

"He was named Aloadin" ('Ala-ad-Din Muhammad, 1220–1255, the last chief of Alamut,) "and his religion was that of Mahomet. In a beautiful valley enclosed between two lofty mountains, he had formed a luxurious garden, stored with every delicious fruit and every fragrant shrub that could be procured. Palaces of various sizes and forms were erected in different parts of the grounds, ornamented with works in gold, with paintings, and with furniture of rich silks. By means of small conduits contrived in these buildings, streams of wine, milk, honey, and some of pure water, were seen to flow in every direction.

"The inhabitants of these palaces were elegant and beautiful damsels, accomplished in the arts of singing, playing upon all sorts of musical instruments, dancing, and especially those of dalliance and amorous allurement. Clothed in rich dresses they were seen continually sporting and amusing themselves in the garden and pavilions, their female guardians being confined within doors and never suffered to appear. . . .

"In order that none without his licence might find their way into this delicious valley, he caused a strong and inexpugnable castle to be erected at the opening of it, through which the entry was by a secret passage."

This description is still perfectly recognizable. The reason why it has escaped other travellers is that (with the exception of the one party above mentioned) they have never followed the old way from one end of the valley to the other. It is only by so doing that one would notice the "two" mountains, the castle or castles at the entrances, and—according to native reports—the remains of water conduits above Shirkuh. The delicious fragrance of the shrubs is still noticeable as one comes down into the valley from the west, and the whole passage bears the stamp of an authentic report with only those parts exaggerated which the reporter could not see for himself.

On this view, the Assassin fortress is not the Rock at Qazr Khan only, but the whole valley; a stronghold like the Doone valley, where the Old Man's palaces and secret gardens might be scattered anywhere between the enclosing precipices and three protecting forts. There is also a strong linguistic proof of this. The name of Alamut is only used by the natives for the valley as a whole: the Rock of Qazr Khan is not called Alamut at all except in the loose way in which they will give the name of the region to anything within it which has none of its own. As it seemed to me important, I questioned people over and over again in various villages on this point, and was always told that there is no particular place called Alamut in the valley, but that it is the name of the region just like the other names, Rudḫar, Salambar, etc., on either side of it. This of course would not prevent the old writers, when they heard of Alamut as the Assassins' home, from writing and thinking of it as one fort or village.

We sat on the highest "burj" for some time, among stunted cedar shrubs and thorny bushes. Kites, very tame, came crying over us. From here the whole valley appeared, and more than the valley, for we looked over the top of the cliff of Garmarud south-eastward to where in a wild and lonely country of blackish rock the Alamut stream comes in from its source under Elburz. Westward, half lost in vapours, we saw the Chala hills and Shirkuh, and the place where the other sentinel fortress must have stood. The rock of Alamut itself was hidden by a series of water-worn red ridges, but the summit of Haudegan showed in the north-west. Due east was Takht-i-Sulaiman; and south of him, after the nearer obstruction of Mount Pichiban, on the Salambar, came a half-circle of great hills, Narghiz, Khakin or Nazar Kuh (?), Asatar, Tundurkhan like a tumbled iceberg, with the Tundurkhan pass on the west of him, and the group of Elburz south-south-east, with five peaks, Elburz, Zardegular, Khoshechal, Zivarchal, Darbend, and—lower and nearer—Siahsang. The height of these hills averages, I should think, 13,000 feet. Elburz is the highest and most easterly of his group. According to 'Aziz the other summits bow towards him, though this is not visible except to the eye of faith. He is the sovereign of his land. The legend has it that Siyalan alone across the valley boasted himself higher and turned his face disdainfully northward towards the sea: but when the Flood came, he also was submerged, and Elburz alone was left above the waters. "And that is why, whenever we leave his presence, we bow to him," said 'Aziz.

We bowed to him, and reluctantly made our way down, and what with necessary care on the steep slabs, and an occasional look round for ibex, and a pause while the two men found and ate wild garlic from the clefts of the rock, it took us one and a half hours to reach the Neck of Graves. Ismail had the samovar ready; we rested in the shadow of crags among small clustering lily flowers and looked up at our fortress against the sky; and another hour's descent took us to Garmarud.

That evening, after the pilau, the elders of the village called and sat about on the felt rugs, passing the "qalian" from hand to hand. It was a handsome object, made out of a hollow gourd which had been educated into the shape of a hexagon by having six pieces of flat wood tied round it as it grew, on the same principle as for Chinese ladies' feet. The dominie joined us, a lantern-jawed, sad young man whose wife had become demented after the loss of their child. There was no home for her nearer than Tehran. I had met and spoken to him before, as he was cutting his small harvest with a hook on the hillside. They all discussed topography with an enthusiastic vagueness which made one despair. Presently my guide strolled in, settled his long length bit by bit on the floor, and produced the jewel, his father's heirloom. It was a glass marble, one of the better sort, with a pink spiral running through its centre; the society of Garmarud looked at it with the same wondering admiration which I remember myself once upon a time. I had to price it, and fear I disappointed them, though I did my best. They thought I was depreciating it to get a better bargain.

Our next day was to take us over the watershed to the Caspian jungle, but I had a moment's misgiving, for 'Aziz hesitated. His wife told us that he always lingered much too long in Kazvin or Khurramabad and neglected her and the shop as well. She pretended to be in a great fury about it, and in the middle of

a fiery harangue, she turned to me and winked, as to a natural sister and ally. She looked extremely pretty, and 'Aziz listened to it all with a delighted smile while the amused assembly asked me to arbitrate. But, pleased as I was to see any man henpecked in Persia, even though with the natural injustice of things it happened to be the most amiable of husbands, I could not give up my guide. I promised to send him away from Khurramabad and all its dangers as soon as I possibly could.

So with blessings next morning we left the little family grouped on its roof to say good-bye, and, as they would take no money and I had nothing more to give them, I offered my shoes and took to the native footwear, which I found excellent for this country except in snow. Through the eastern "gate" we went, between two precipices where path and torrent tumble through together, and the Alamut water is clear, for the red earth stops at the gate of Garmarud. We left the stream and zigzagged slowly north-eastward towards the Salambar. This is a wild, rocky, and solitary region, where my map gave no villages at all. There are two however on the upper Alamut: Narmilud, and Dinerud which is said to count sixteen houses and is important as the manzil for the Tundurkhan pass. It is said to be 5 farsakhs' distance from Ghazinan on the southern slope: thence by Shahrak in the Talaqan valley, and Farzandeh Buzurg (1000 houses ?) the caravans go to Tehran. In summer the track from Garmarud follows the Alamut by a little imamzadeh we could just see below us; but when the stream is in spate, there is an alternative way by Aranek on the opposite hillside below a place where another old fort is said once to have stood. From Salambar there is also a direct track usually taken by the charvardars for the Tundurkhan. This pass now lay opposite, across the valley and gradually below us as we climbed, and 'Aziz told me that it is more used than any other across the western Elburz range, and that although it is deep in snow for many months, it is always practicable and in winter is covered by what he called an avalanche, but what looked like a snowy couloir about as steep and smooth as the Theodule glacier, and over which laden mules can walk safely.

The charvardars knew of no other inhabited place in all this district up to the ridges of the Takht-i-Sulaiman. The country lay, blackish in colour to the snow-line, with no sign of cultivation upon it, and for six hours, while we climbed to the pass, the mass of Elburz stood over against us with drifts and black ridges and summits like a broken sea. The peak itself is at the point where a sharp ridge, rising towards the south, runs into a great semicircle of rock at the top, rather like a T with a deep pocket of glacier on either side between the stem and the two arms. I call it glacier because the men say that this snow never melts. From the south it is said to be an easy meadow slope to the very top; but from Salambar it looks difficult though not inaccessible (a word often too recklessly employed), and it would be fun to try. I sat for some time in the sun, looking out possible routes and drying myself after falling into a torrent, while Ismail and 'Aziz ate wild rhubarb and asked information of wayfarers, of whom a constant stream were going up.

Pichiban is the name of all the land on the southern face of the pass, and it includes a miserable hamlet and a low backbone of hill. Beyond these, through small melting streams and snowdrifts, by cairns which mark the way in winter, we came to the chaikhana at the top—11,290 feet—and took shelter in its tepid

twilight from the wind. There we looked over the Caspian slopes; saw Narghiz on the east, and Takht-i-Sulaiman and Nawas beyond him, and on our north-west the peak of Siyalan. The Siyalan route, which joins our track lower down at Chaldarreh, has four villages on this side: Asir Mahalleh, Haluqala, Kileshan, and Ushtat. Of these the first is only inhabited in summer, and all these villages belonging to the Jangali shepherd tribes have a fluctuating population, since each group owns both summer and winter quarters and goes from one to the other according to the grazing, so that in summer the traveller would find many empty houses in the lower valleys, while in winter the highest villages are deserted altogether. These Jangalis under their leader Kuchik Khan held their country against us when the Dunsterforce was opening its way to Baku and Tabriz. They were defeated at Manjil on the Sefid Rud, but east of that they remained masters of their impenetrable forests. They tried to press southward over the Salambar, but here they were taken on both flanks and repulsed apparently by a Persian force.

The name of Salambar strictly belongs only to the northern slope and to a village which corresponds in position and misery to that of Pichiban. The descent is much more sudden than on the other side, and where the snow patches ended, the hillside was clothed with broad-petalled, saffron yellow iris. Here, and at the feet of Narghiz, are the headwaters of the Seh Hizar river. We slept at Maran, a large village on the slope, and the regular manzil after the pass. Here again the people seemed very poor and ragged. We spent the evening arguing whether opium was forbidden or not by the Prophet, and heard how the road lower down was crumbling away. Until recently, most of the villages between Kazvin and Khurramabad, or Tunakabun as it is universally known in its neighbourhood, belonged to a nobleman spoken of as the Emir Sipahsalar, a minister under the late Shah. The present regime looked into his accounts, and then suggested that it would be better if he committed suicide: which he did. One of his sons is exiled; the other went out with some friends for a shooting party and never returned; and the Government has the property. This story was often told me by the country people, and apparently with regret; and there were good points about the Emir, for while he collected a regular tax from the charvardars for the upkeep of the roads, he really attended to them, and every bridge or bit of causeway in tolerable repair is pointed to as his work. Now the tax is abolished, but the roads also are on the way to annihilation, a fact that will do as much as anything else to divert the traffic to the new coast way to Mazanderan and Resht and destroy the old commerce of the charvardars.

We realized all this next morning, for we had to skirt the canyon of the Seh Hizar by a very steep way in place of the regular track. It brought us out high above the opening of the Darjan valley, and showed us most beautifully the three peaks, Nawas, Takht-i-Sulaiman, Nazar Kuh, glittering at its head. This looks like a good approach for the Throne of Solomon, and there are three villages, Darjan itself with about one hundred houses half a farsakh upstream, and Sern and Shahristan smaller and farther on. After this the main valley narrows between steep sides. The small scrub gradually expands into trees of the jungle. Beyond the few houses of Yuj and Qazi Mu'alleh, the Arud valley branches off on the east and leads through Arud village (about twenty houses

half a farsakh away), north-east over a steep pass to Dakuh, a village of about one hundred houses mostly for summer, near the head of the Iza Rud. Siemeshta, Pulesera, Mu'allim Kuh, Kutra, Kadkalleh, and Nishtarud near the sea were all described as villages on the Iza Rud; but though I discovered their order, I could not get information as to the distances between them. It was, I found, most difficult to get anything but the vaguest information about any valley except the one we were actually in, and even there I sometimes remained uncertain, though I never accepted any statement until I had verified it by asking several people, possibly at different times. Ismail frankly invented names whenever I wanted them, and I only corrected him by attributing all the mistakes in my map to things he must have said to previous travellers, which caused him to be teased by all the company, and made him promise amendment.

We now rode for hours down the long shaft of the Seh Hizar, with hardly a side glen branching off it, and no human dwelling except an occasional log-built slat-roofed chaikhana where the traffic of the way can take a rest. All here was green, kept so by the mists and dews: at 9 o'clock in the sunshine hawthorns and briars threw showers upon us as we passed, and the trailing swathes of mist from the sea still lingered in curves of the hills. Wild pear and plum and apple mingled with sycamore and beech tree and the "divar" whose glossy ribbed leaves I first took to be chestnut until I looked more closely and was told that the tree has no fruit. Here we experienced the only danger of the trip. As we turned a narrow gully, about a dozen great boulders crashed across our path from above, nearly snipping off the head of Ismail's pet donkey. "Ya Husain," said Ismail, and with great presence of mind headed off the caravan. 'Aziz did not appear to such advantage, for as soon as the slide had ceased, he pushed himself past us at a trot and got through to safety on the far side, explaining afterwards by opening and shutting his fingers that his heart had been "going like that."

Who can describe the beauty of this forest country in its loneliness? The white stream rolled its boulders; the trees, like some Pyrenean forest, turned up their dustless shiny leaves in the wind which blew constantly and gently up the gorge. Little uninhabited glens, aisles of tree stems, sloped down to the river. The valley of Garmedar, untrodden except by some jungle shepherd in summer, brought its clear water from the heights of Siyalan. All but the highest hills are wooded to the top and very silent. Ibex and pig and panther were reported, but invisible; and even the flowers, the big pink vetch and scarlet poppy filled with yellow stamens, and bracken found on the upper slopes, disappeared as our path entered more and more deeply the shadow of the woods.

The path itself was alive enough with the gipsy fellowship to which we now belonged—a moving fraternity which lives on the road and has its friends and gossips at the resting-places. We met and passed and met again, waited to cross at narrow corners where the packs of the mules bulged out over the torrent, or threw a greeting to men who squatted over their samovar by the wayside. They were hillmen very different from the long-faced Persian of the town; with wide brows, and thick black hair bunched out under the round black felt cap; and a white frieze coat or a close-fitting blue cotton jerkin like their trousers, over which they wound a long sash, and a thong over that again,

for the mules. If they were older men their beards were cut short in the Moslem way and red with henna. A short leather sheath behind their waist, for a small knife, and the long goad needle, with two blue beads on the tassels for luck, was all the arms they carried: and the straight-stemmed Kurdish pipe would stick in their sash in front. As we passed 'Aziz would say: "These are from Alamut, or Rudbar, or away over the hills from Talaqan," as the case might be, and would greet them with cordiality which lessened in a regular proportion as they lived farther from his own home.

Sometimes there were thirty of us or more together. We would leave the forest shadows to cross and recross the Seh Hizar on cantilever bridges of which there are a great number. The river is otherwise unfordable at this time, a rushing flood with fish in it, which I tried to buy from two small children who held a long string of them but fled at our approach. These were Jangalis, and we now began to meet them cutting wood in the forest, or in troops as they moved up to the summer pastures with their sheep and black goats and small humped kine. They were wild shy people, a different race, whiter skinned and with finer features than the peasant type of Alamut, and they spoke their strange Gilaki tongue. They wore sheepskin cap and shoes, and a rectangular sleeveless coat of thick felt stiff as a board upon their shoulders against the incessant Caspian rain: and I found them friendly, and went with them to see their young calves, penned together in shanties of interwoven boughs, with a great bunch of beech leaves, branches and all, tied by a rope from the ceiling so that it revolved slowly while they browsed. They use this as regular fodder and strip the standing trees of their boughs, and in winter use the dried leaves as hay.

Halwan, Saraspi, Khainan, Gavar, Yandasht, Chaldarreh—where the Do and Seh Hizar rivers meet—are all small groups of log houses, very roughly built, with a wheatfield or two around them, on the banks of the Seh Hizar; Khainan a little larger than the rest with a track across to the Do Hizar valley. From Yandasht a track goes eastward to Levisar in the hills, a village of about fifty houses mostly for summer, and said to be one farsakh away. It is on a stream which runs into the Valmirud lower down. Another track, from a glade in the forest called Alukaleh a little above Chaldarreh, leads off on the right to three winter villages, Tosakalom, Kalpushteh, and Latak, and then again rejoins our track: we could just see slats of the wooden roofs through the trees.

We did not reach Chaldarreh in one day from Maran, but spent the night at Gavar, which is a regular resting-place for the caravans and has a two-storied solid wooden guest house built by the Emir Sipahsalar for his shooting parties. Four Englishmen once came here as his guests making for Takht-i-Sulaiman, but whether they reached the top or not I could not learn. I chartered an upper room, and we sat on the balcony round an earthenware brazier for tea, while the caretaker and a traveller or two joined us and discussed religion. These people are all strongly Shi'a Moslem; nothing else, so far as I could see, not even Bahaism, has penetrated the hills. It was religious propaganda which made the Jangalis so intractable during the war, and the southern hillmen also are fanatical though peace-loving. Kerbelai 'Aziz, as his name showed, had made the pilgrimage to the four holy cities of 'Iraq, taking a month to walk from Garmarud to Karbala: and I, who have visited the Imam Musa's tomb,

found that this shed a sort of glory upon me, and, Christian though they knew me to be, I found no difficulty in entering the mosques or pausing with 'Aziz at their wayside shrines.

At dawn next day, from my bed on the balcony, I could see the caravans getting under way, the mules being groomed down and the packs being fixed on in the cold wet light and dew-drenched grass. In spite of what I had been told of Persia, I never saw an animal ill-treated here. We followed leisurely, and gradually came to lower hills and open park-like glades where the path wanders less restricted among boulders and small streams which begin to be taken off for irrigation, and where new trees, a sort of acacia called Qarad and others I did not know, began to appear.

After about four and a half hours we left the Hizar stream to flow on by Kushkuh, Kandasareh, Zangashar Mahalleh, and Shahsavar to the sea while we crossed a low spur eastward called Imam-i-Zamin which I should have taken to be a vestige of the old causeway built by Shah 'Abbas along the coast, but that the charvardars all told me that the Emir Sipahsalar was responsible for the surface of big stones which made it possible in winter. Thence we descended, forded the shallow Valmirud by Valmirud village, climbed the last small barrier, the Qal'a Gardaneh pass, and saw the Caspian before us. Below us lay a flat landscape that might have been painted on a Chinese lacquered tray; it shone like an old dull mirror with innumerable watery rice plots divided by tiny mud barriers; islands of trees, orange and pomegranate in flower, rice-thatched beehive roofs and little thatched pagodas on four pillars, where the rice is threshed as it is garnered, were dotted here and there; and water everywhere. The oxen, half submerged in water, were ploughing the invisible ground. The ditches were full of yellow iris and blue and black dragonflies; and even in the daytime there were clouds of mosquitoes.

Here, an island of tree-hidden roofs, was Khurramabad or Tunakabun, with a few good red-tiled houses, and a green common, and a country market-place where shopkeepers from Resht spread awnings twice a week and sell European oddments among the bright silks for which this coast was famous. The place had some pretensions, for the dead Emir had his country house here. His neglected garden, his marble tank and cypress avenues, the roses and orange trees, still make a pleasant place to wander in. In one of his houses they now have a Government school, and I found myself again in an atmosphere of Progress. Small boys in Pahlevi hats recited moral tales in high-pitched voices.

A new road runs along the coast from Resht to Mazanderan, complete except for some of the bridges. Along it one can get cars, "if not to-day, then in a day or two," said my host the Doctor, as he sat among his tea things and prepared injections for a patient behind him, and got the spoons and the needles distressingly mixed. We found the car, and I parted from 'Aziz and Ismail and turned away from the hills. As we splashed through the Seh Hizar at Shahsavar, and climbed out to remove its submerged boulders from the path of the miserable Ford, I thought with indescribable longing of the lovely silent reaches from which that water came.

ANTARCTIC METEOROLOGY

BRITISH ANTARCTIC EXPEDITION 1907–09, under the command of Sir Ernest Shackleton. Reports on the Scientific Investigations. Meteorology. By Edward Kidson. *Melbourne: H. J. Green* (Government Printer) 1930. 11×9 *inches;* 188 *pages; diagrams and maps.*

In a recent review of the first scientific reports of the *Discovery* Expedition for the investigation of the southern whale, one of the writers referred to the difficulty experienced by many leaders of expeditions in raising sufficient money to ensure adequate publication of scientific observations. No better example of this difficulty could be provided than the case of the Shackleton Expedition 1907–09, the scientific results of which have been largely lost through lack of funds to publish them, or have lost in value through delay in publication. The expedition had no trained meteorologist, but Professor Sir Edgeworth David, the chief of the scientific staff, although a geologist himself, interested himself very closely in the meteorological log kept by Lieutenant Adams, the second in command of the expedition, assisted by all other members as occasion served or the need called. As Dr. Kidson records, the preservation of the record was due to Professor David, who had made considerable use of the meteorological observations in preparing the volume on the geological observations, which is the most ambitious of the Expedition's scientific publications. Publication of the Report on Meteorology has now been made possible by the generosity and wise policy of the Australian Commonwealth Government acting on the recommendation of the Council for Scientific and Industrial Research. The Polar Research Institute at Cambridge University, although insufficiently endowed to help in such work on a large scale, also made a small grant towards Dr. Kidson's expenses.

Dr. Kidson deserves the thanks of all who take an interest in Polar meteorology for this volume, which is the direct result of his interest in Dr. Simpson's discussion of the meteorological data of Captain Scott's *Terra Nova* Expedition, which led to the rescue of the meteorological data of Shackleton's *Nimrod* Expedition. The data are defective in many respects, and Dr. Kidson is to be congratulated on the good use he has made of what is available.

While adopting generally the conceptions developed by Dr. Simpson to explain the meteorology of McMurdo Sound, Dr. Kidson joins issue with the latter on certain points, and these portions of the report are naturally of exceptional interest.

As emphasized by Dr. Simpson, normal conditions over the Antarctic favour the formation of a stable layer of cold air. This results partly from the snow-covered surface, which has very low specific heat and heat conductivity and thus favours a quick transformation of heat from surface to air, and partly from the fact that radiation from the surface is greater than that received from the sun for almost the whole of the year. As a result the air temperature lags only a few days behind the intensity of solar radiation. At the same time, everything favours a drainage of cold air from the continent and shelf-ice towards the sea, and this drainage, when favoured by air pressure changes, develops into blizzard winds from a southerly direction. At other times winds may be prevented from reaching the surface of the Earth by the presence of the stable cold layer. Many calms, many (often strong) south-easterly winds, and few northerly winds are, as Kidson states, the basis of the weather of McMurdo Sound, and it is only during strong blizzards that uniform conditions will obtain and a true measure of the temperature of the general mass of the air be available. As a corollary, we would

expect to find that the coldest years should be those which are least windy and *vice versa*. It will probably come as a surprise to those who have not studied this or similar regions that the group of stations in McMurdo Sound—Hut Point occupied in 1902 and 1903, Cape Royds in 1908–09, and Cape Evans 1911 and 1912—experienced mean temperatures which varied in the different years between +3·3° F. and −2·7° F., while the mean temperatures of individual months varied much more, sometimes as much as 15° F. in the autumn and winter months. How much of this variation is due to differences in the immediate terrain and surface conditions is not clear, but Kidson considers that the general mass of the Antarctic air was warmer in 1908–09 than in 1911 or 1912, which were the two windiest years. There is no doubt that there was much more thaw in the summer of 1909 than in the other years mentioned.

One exceptional feature of Cape Royds meteorology was the high winter temperature which may owe something to a greater proximity to the open sea, since the only year which compares with Cape Royds in this respect is that of 1912 at Cape Evans, when open water was not far from the station at any time during the winter. Even in the months when the sun is above the horizon, great variations in temperature may be expected from year to year and from place to place in the more mountainous portions of Antarctica, since the winter accumulation of snow does not lie throughout the summer in those places where the retreat of glaciers or other causes has recently exposed bare rock.

Cape Royds was also exceptional in 1908–09 in that the diurnal range of temperature was greatest in October and generally greater in this and other months than for the mean of all the stations in McMurdo Sound. The maximum in October places Cape Royds in the same category as North Polar stations, the explanation for which was given by Dr. Simpson as the change in surface (snow) conditions with the advance of the summer.

Kidson points out that the diurnal variation of temperature depends on the relation of the equilibrium surface temperature to that of the general mass of air, so that if the air temperature is higher, a cold surface layer of air must form for a large part of the day, while the greater the temperature difference the colder and more stable the layer must be. The diurnal variation in temperature will be large if the air temperature is higher, and Kidson deduces from this that the greater amplitude at Cape Royds than elsewhere in McMurdo Sound was due to a higher temperature of the general mass of air. He gives as a further reason that 1908, being less windy, would be expected to be characterized by a higher proportion of snow surface and that this snow would be more loosely packed.

He devotes a very interesting section to the diurnal temperature variation in the three dark months and discusses the features—especially the temperature rise about 4 a.m., which has already received considerable attention from Dr. Simpson. He shows a convincing diagram (Fig. 3) in which the diurnal variations of temperature, pressure, and wind are plotted together for McMurdo Sound. It seems clear that all three are closely related, and that the temperature variations are probably due to variations in the strength of the wind.

The comparison of the Cape Royds temperature observations with those taken on the *Nimrod* while in McMurdo Sound in January and February is also full of interest, especially in respect of the diurnal variation of temperature which was larger in the Sound than at Cape Royds, except when in the open sea, and especially large in clear weather with calms or light winds. At the same time the mean temperatures measured on the *Nimrod* were the lower, suggesting that the conditions were more favourable to the development of cold surface layers than at Cape Royds. Kidson considers the Sound must have been covered by a layer of cold air drifted on to its surface from the Ross Barrier and snow-covered land

or ice. While this explanation is certainly valid for the occasions when the *Nimrod* was lying alongside Glacier Tongue or Butter Point or even drifting in the pack, it is less easy to see how such a layer could be maintained far from land and lying over the warmer sea without the development of considerable turbulence, or how the air lying on a surface of high specific heat (the sea) could cool quickly at "night." Perhaps the explanation of the difference in temperature and in its diurnal variation is more clearly seen when expressed in terms of the local conditions at Cape Royds, which are certainly very unfavourable to the development of cold layers even temporarily at this time of year, when the slopes of Cape Royds are generally bare of snow. Certainly the records indicate that there are no great differences in the sources of the air in different parts of the Sound.

Considering all the evidence, the writers feel that Kidson's contention that the year 1908–09 was generally a year of high temperature in McMurdo Sound is probably justified, while the warmth of the winter months may owe something to the proximity of the open sea to Cape Royds and the greater prevalence of northerly winds.

In the section dealing with the temperatures measured on the Ross Barrier in November and February, he states that the figures for diurnal variation of temperature were less than half those given by Simpson, and suggests that his figures may have been incorrect. We feel however that the difference might well be the result of conditions associated with the suspected higher summer temperatures of 1908–09. November and February are in any case months when conditions are liable to be changing rapidly on the Barrier, and we would expect the diurnal temperature variation to be very sensitive to changes in the texture of the snow surface. This texture will depend on temperature and also become more compact as time elapses since the last fall of snow.

Kidson refers to the rapid fall of temperature on the Barrier in the autumn, which seems to be a feature of this part of the world and which was regarded by Captain Scott as exceptional and an important cause of the disaster to his party.

One of the interesting features of the Barrier temperatures observed on the Shackleton Expedition was the fact that the temperature difference between Cape Royds and the Barrier became less whenever the sledging parties were opposite one of the great outlet glaciers from the Plateau, where turbulence associated with the downpouring wind would be expected to annihilate the cold surface layer lying elsewhere on the Barrier.

The chapter dealing with the winds at Cape Royds is important chiefly in the amplification of the data available to Simpson. It is interesting to note however that northerly winds were much more prevalent at Cape Royds in 1908–09 than at the other stations, and this circumstance may be associated with the high winter temperatures, whether characteristic of the station or of the year of observation. He makes one point which deserves emphasis, namely, that blizzards in this region are of various types, so that no single explanation will account for all blizzards. The final section in this chapter refers briefly to the *Terra Nova* and *Nimrod* observations farther north, and suggests that the common idea that easterly winds are prevalent just north of the Antarctic circle may be incorrect.

The section of the report dealing with precipitation, ablation, etc., is interesting, but as no satisfactory method of measuring the quantities has been evolved, the author's discussion is necessarily limited chiefly to estimates. The section dealing with humidity refers in an interesting way to the difficulty of making such measurements with wet and dry bulb thermometers when the temperature is well below the freezing-point of water. Kidson quotes the conclusion of David and Mawson that in cold calm winter weather the wet bulb was frequently higher

than the dry bulb thermometer, due to condensation from the super-saturated atmosphere, the difference in temperature of the two thermometers being then a measure, not of the cooling by evaporation, but of the heating by condensation. Certainly the months which had a mean relative humidity greater than 100 per cent. (measured in this manner) were the coldest of the year.

The most interesting and possibly the most controversial section of the report is that headed "General Considerations." This section is largely a criticism of the views in Dr. Simpson's report which doubtless require modification in the light of new knowledge and recent developments. In essence Kidson regards the pressure waves as initiating Hobbs' "strophs" of cold air from the elevated cold domes of Greenland and the Antarctic, the pressure waves themselves arising in lower latitudes. Kidson claims in fact that the Antarctic pressure waves are of the same type as those observed in Australasia, the apparent travel of the Antarctic pressure waves outward to Cape Adare being due to the inclination of the trough-line towards the north-west.

The report concludes with an attempt on somewhat inadequate grounds to relate the seasonal variations in Australia and sunspot activity with the seasonal variations in the Antarctic so far as these are known or suspected, and closes with a plea for further investigation in the Antarctic. As Kidson puts it ". . . it is obvious that a study of the great polar caps is of the utmost importance, since they have so great an influence in deciding the use to which the solar radiation which reaches the earth is put." The final paragraph and plea for adequate scientific equipment and staff on Polar expeditions is obviously inspired by the difficulties he has had to face and surmount in reporting on the somewhat sketchy meteorological data, which, but for his special interest in these problems, might never have seen the light of day.

C. S. WRIGHT.
R. E. PRIESTLEY.

HISTORY OF CANADA AND NEWFOUNDLAND

THE CAMBRIDGE HISTORY OF THE BRITISH EMPIRE. Vol. VI. Canada and Newfoundland. Edited by J. HOLLAND ROSE, A. P. NEWTON, E. A. BENIANS, and W. P. M. KENNEDY *Cambridge: University Press* 1930. 10 × 6 *inches;* xxii + 940 *pages.* 35*s*

THE Canadian and Newfoundland volume of the monumental history of the British Empire in eight volumes does great credit to Prof. Holland Rose and his co-editors. In such a cooperative work there is bound to be some unevenness, and one notices, for instance, that while the period after 1791 is described in 610 pages, only 200 pages are devoted to the early period down to 1791. There is a good account of the geographical background, but the chapter on the period of discovery is marred by several inaccuracies. Labrador was the one point, in the opinion of the reviewer, where John Cabot certainly did not land: for he saw no icebergs. Later in the volume Prof. Newton gives Cape Breton, which receives additional support from a recent paper by Prof. Ganong. Gaspar Corte-Real sighted Labrador first, not in 1500, but in 1501, and was lost in 1502, not in sailing northward but southwards towards the West Indies. Dr. Lanctot has also misread the meaning of Cartier's third voyage. It was just as official as the first two ventures, for the King contributed a very large sum of money, and it sailed under his direct authority. Champlain's career receives scant justice. He returned to

Quebec in 1616, not by the St. Lawrence, but *via* the Ottawa. On p. 22 Nansett should be Nauset. For the later period Dr. Lanctot's account is excellent. Senator Chapais' chapter on the Old Regime is good, but this whole period is treated far too briefly. It strikes one as clumsy to write De La Barre, De La Galissonnière, and *coureurs des bois* is wrong, as is also *tierra* on p. 123.

Prof. Rose gives a refreshing account of the wars between 1682 and 1748, with constant references to the situation in Europe. He has used the English colonial records to the very best advantage, but to blame Champlain for linking up in 1609 with the Algonkins instead of with the Iroquois is unhistorical. Champlain's one aim was discovery, and he had no other choice. It is of interest to learn that Louisbourg was given back in 1745 not merely for Madras but for Madras "*plus* the Belgic and Dutch lands conquered by France" (p. 90). The period from 1749 to 1760 has also been treated in a brilliant fashion by Mr. C. T. Atkinson, of Oxford. Not only has he given his references in full but he has read the sources afresh and written a very entertaining account of a much-hackneyed theme. He rejects the late General Mahon's theory of treachery at Samos.

Prof. A. P. Newton's account of the early years of Newfoundland is good, although the story is not continuous and moves, as it were, by fits and starts. For the period from 1760 to 1774 no better choice could have been made than Prof. Burt. He deals with the politics of this time with insight and knowledge. He has profited, it is clear, by Prof. Coupland's admirable study of the Quebec Act. Prof. D. A. McArthur gives a brilliant account of the years from 1774 to 1812, with a table of exports on p. 217 which is very instructive. On p. 200, note 1, "1898" should be 1818, and the same on p. 237, note 1.

Prof. Fryer of McGill gives a reliable account of the years from 1815 to 1837 in Lower Canada partly based on material in the Library at McGill, while for the period from 1815 to 1837 in Upper Canada and 1837 to 1854 in Canada itself, the editors have relied on the expert pen of Prof. J. L. Morison, of Newcastle, formerly of Queen's. He praises Sir John Colbourne, but tries to be fair to W. L. Mackenzie. One imagined that Francis Head's appointment was due to the delivery of a letter to the wrong man. In any event it proved a mistake from every point of view, as Prof. Morison points out. Never has Durham's mission received clearer or more satisfactory treatment, but it will shock some readers to learn that "it is disquieting to those who believe in the imperial responsibilities of senates to witness a house of peers break faith with their most distinguished proconsular servant at the bidding of an insane rhetorician like Brougham" (p. 298).

The growth of responsible government in the Maritimes has here received adequate treatment for the first time at the able hands of Prof. Chester Martin, of Toronto University. He covers the whole period from 1815 to Confederation in 1867. Nova Scotia was the only province to force responsible government without first arranging for a permanent Civil List. Dr. O. D. Skelton, the Deputy Minister for External Affairs, gives a valuable account of the period from 1854 to 1867, when, thanks to Reciprocity, Canada enjoyed a period of prosperity. He has consulted the Baring papers, which are proving such a very valuable addition to the Public Archives at Ottawa. Dr. Adam Shortt, who was instrumental in securing these papers for Canada, treats in Chapter XV of the financial development from 1840 to 1867. Thanks to his knowledge of the local press of those days he is able to present an authoritative account based upon his own researches.

As one does not find enough on the earlier discoveries, it is satisfactory to read Mr. L. J. Burpee's account of "The Opening of the West," on which he is an authority. The wonderful achievements of both the French and English discoverers of those parts is treated succinctly but clearly, although of course their routes have not always been made out even to-day

As the volume advances the periods treated become more varied. Thus Prof. R. G. Trotter treats not only of the "Coming of Confederation," but also of the "Expansion of the Dominion to 1880." Some of the best chapters are those written by Mr. W. Stewart Wallace on the history of Canada from 1867 to 1921. These are remarkable productions which do honour both to this History and to the author. There are several chapters by experts in Economics, Agriculture, Industry, Banking and Commerce which give valuable data regarding the development of these during the latter half of the nineteenth century. Newfoundland's history from 1783 to 1921 has also been treated by an ex-Governor, Sir C. A. Harris. The Constitutional Development from 1867 to 1921 has been discussed by Prof. Kennedy, who was the Canadian editor of this volume, while Mr. N. W. Rowell, K.C., has written an illuminating chapter on Canada's position in the Empire from 1884 to 1921. As he himself played an important rôle in much of this evolution no one could have done it better.

The volume is brought to a close with two excellent chapters on Cultural Development, both French and English, by MM. La Roque de Roquebrune and Montpetit and Sir Robert Falconer. They give a delightful account of the growth of culture in the Dominion, and will be read with profit and interest by all Canadians.

The bibliography, which occupies some 72 pages, attempts too much, and would have benefited by considerable pruning. Part I, on the MSS. sources, by Dr. A. G. Doughty, covers too wide a field in attempting to describe the Canadian MS. material not only in Canada but also in France and England. It can be of no help to a student to learn that Series Z in the Archives Nationales consists of *Juridictions spéciales et ordinaires* with not a single reference to Canada. One misses any mention of *Nova Francia*, the organ of the *Société d'histoire du Canada* in France, which often prints valuable unpublished material.

In Great Britain we have accounts of the contents of both the British Museum MS. room and of the Public Record Office. At the former both the Bouquet and Haldimand volumes form part of the Additional MSS. and are not separate series by themselves. At the Public Record Office, under the War Office no mention is made of W.O. 34, although it is referred to in the bibliography under Chapter IX. The Collection of papers copied for Canada at the General Post Office has been overlooked, as have also the transcripts at the Royal Institution of the Dorchester Papers which were recently sold to America. The Selkirk papers are not originals but copies. This list will certainly prove useful to students.

The accounts of the various Provincial Archives should prove helpful, but would have been even more so had a list been given of the various publications issued by them, particularly by the Province of Quebec.

Part II, on the printed sources, has been whipped somewhat into shape by Prof. R. G. Tucker, but is badly arranged and full of repetitions. Under Section VI on Historical Atlases not one is given. Kunstmann's (not Kunstman's) appears on p. 847, but those of Jomard, Nordenskiöld, Kohl, and Marcel have been completely overlooked. The latter's 'Cartographie' is an addition to Harrisse's 'Notes,' and was originally printed in the *Revue de Géographie*. Harrisse's 'Bibliotheca vetustissima' might well have been omitted, for the few references in the first volume issued in 1866 were set out in greater detail in his 'Notes,' etc., published in 1872. Hakluyt's 'Divers Voyages' contain nothing on Canada.

Under "Printed Documents" one looks in vain for the collections issued by Thwaites, Brodhead and O'Callaghan, Margry, Clement, Casgrain, Force and Ford. They turn up eventually scattered here and there under various chapters. The same is the case with the valuable collections printed by the Government of Quebec. Even Christie's History contains unprinted material.

In spite of such defects the lists should prove helpful to students. There are few misprints. On p. 859 Gérin-Lajorie should be Lajoie, and one looks in vain for Colonel Dudley Mills's excellent study of the Ashburton Boundary.

H. P. BIGGAR

THE RECORD OF THE R.G.S.

AN APPRECIATION BY THE PRESIDENT

THE RECORD OF THE ROYAL GEOGRAPHICAL SOCIETY 1830–1930. By HUGH ROBERT MILL, D.SC., LL.D. Published at the Celebration of the Society's Centenary October 1930. *London: The Royal Geographical Society* 1930. 10×6 *inches;* xvi+288 *pages; with* 35 *plates and* 1 *folding chart.* 10*s* (7*s* 6*d to Fellows at the House of the Society*)

VARIOUS and appreciative notices have appeared in the Press of the *Record of the R.G.S.* It is reserved to us in the intimacies of our own *Journal* to express that appreciation in full.

To the author it has been a labour of love, and that too in the fullest sense of the word, for Dr. Mill, with characteristic generosity, reaps no financial advantages for his work and research of the last two years. No man has done more for the Society. His knowledge of the past, his judgment and easy humour have produced a volume of the greatest interest to all Fellows of our Society and to many whose kindled interests will lead them to read it.

The whole gives a feeling of great security. Each step is marked in the advance, each arrest is given its due value. The storms which battered on the walls of the Constitution and helped to strengthen the whole fabric, the early difficulties of initiation and administration, the dissensions of opinion—all find their places till the enterprise from foundation to coping stone is presented complete to the world ready for another century of work and progress.

Dr. Mill has kept before him the expressions first used by Sir John Barrow in his memoranda of 1830—entertainment, rational amusement and the like—as well as the scientific objects of the Society.

In his first chapter Dr. Mill speaks of the causes, the reasons which led to the formation of the Society. Next comes the first executive step made by the Founders whose names are given and whose characters are touched on with light but unerring hand. The descriptions of Sir J. Barrow, Bates, and Robert Brown, among others, are delightful. It is interesting to note that so well were the original resolutions drawn that very slight variation has been necessary during our first century of existence.

The Happy Start duly described, the progress of the Society forms the theme of the next chapters and in early days the want of appreciation of the progress of others—as, for instance, the refusal to assist in the appointment of a Professor of Geography at the University of London indicates. Startling expressions were used from time to time, even by Members of the Council, of each other, and these are treated in a manner which leaves no scar. The close association referred to between the Society and the various State Departments is a matter of happy continuity.

With admirable judgment and easy humour Dr. Mill discloses the mark made by successive Presidents. The majestic figure of Sir Roderick Murchison very naturally takes a foremost place, and many otherwise forgotten episodes are mentioned that form a liberal education to present and future Presidents. Sir Roderick's means and possession of a great house in London enabled him to entertain both Fellows and those he considered were fit to meet them and for

them to meet. He indicates later that the new buildings will provide a meeting place for all such. Dr. Livingstone's affection for Murchison is touchingly referred to. All this will be read with affectionate and intimate interest. Of very intimate interest no part is more important than the account of the violent discussion that took place on the admission of women to the Fellowship. Many years passed before a favourable expression was given on this subject, and Mr. Freshfield's championship, which brought the matter to a happy conclusion, is remarked on.

Exploration takes the field in some detail in the Record, and it is gratifying to note that Presidents and Council were ever on the side of adventure properly conducted—when, as in the case of Nansen, to quote one instance only—the large majority of geographers considered his projected journey in the *Fram* as a scheme suitable only to the wild cat. Here, as much as to any one, recognition is given to Sir C. Markham, whose boyish enthusiasm, added to an adventurous spirit, was only quenched by death.

The book must be read to get the full value of the Society's endeavours in this direction. The Polar Regions, Africa, Asia, all receive their full recognition. Names of great men, gold medallists of our Society, are not only mentioned but mentioned with a short and vivid description of their deeds and journeys.

Nor is the influence of the Society on matters of education forgotten. Mr. Freshfield's name looms large in this connection, and that of Sir J. Scott Keltie, most genial and persuasive of men, is accorded a place of honour on the roll.

The growing desire of educational bodies that better facilities should be given for geographical teaching appears to have been at first only encouraged to a moderate degree, but as time went on moderation gave way to a more proper support, and Dr. Mill shows that the Society may fairly claim to have assisted largely in the institution of professors of Geography at the Universities.

Though the descriptions of exploration and its kindred subject may be more alluring, no part is of greater interest than the change of buildings and locality. Dr. Mill has shown the growth of the Society and the consequent necessity of enlargement from the start to the present time. Here one can only refer to the pages, written with complete understanding, of the part taken by Lord Curzon in the acquirement of Lowther Lodge and of the meticulous attention given by him, as always, to any duty he assumed. The later development, the building of the new theatre and Library—the fulfilment of the aspirations of a hundred years, the opportunity for further effort in these more extended premises, the feeling of Fellowship engendered by the evening meetings in our own hall—all these and other matters are written of with that sympathy and affection for the R.G.S. that Dr. Mill possesses to so great an extent.

It is no plagiarism of H.R.H. the Prince of Wales to say, as he did at the Centenary Dinner, that it is good reading.

The production of the Record is symbolic of the firm ground on which the Society stands. The credit of such production, the fine printing, the excellent paper and the perfect representation of the illustrations are due to the care and skill of Mr. Hinks to whom, as well as for the two chapters which are written by him, acknowledgment is made in the author's preface.

It may be put forward that the Record claims the attention and support not only of the Fellows of the R.G.S. but of the general public.

Its purchase and study will not only add greatly to their interest, they will be a gratification to the author for his disinterested work both in this book and for the Society and will assist to defray the cost of production. It is an admirable performance published at a price which is intended to be within reach of all.

W. E. G.

REVIEWS

GEOLOGIE VON EUROPA. By SERGE VON BUBNOFF. (Geologie der Erde. Edited by ERICH KRENKEL.) Band 2: Das ausseralpine Westeuropa. Teil 1: Kaledoniden und Varisciden. *Berlin: Gebrüder Borntraeger* 1930. 11×7 *inches;* xii+690 *pages; diagrams and maps.* *M.*49.50

The geographical structure of North-Western Europe is largely dependent on the remnants of two mountain systems which were upraised in an early part of the Earth's history. The earlier system, the Caledonian, is best preserved in the British Isles and Scandinavia; the later, the Hercynian, of Carboniferous to Permian Age, has its fragments strewn across Europe from Killarney and Brittany to Poland. The structure, character, and history of these mountain areas are well described in the latest part of Professor S. von Bubnoff's 'Geologie von Europa.' It is occupied mainly by the stratigraphical and structural geology of each of these groups, with full reference to the previous literature, excellent sketch-maps and diagrammatic sections, and an interesting summary of the mineral resources. The volume therefore forms a manual of the older stratigraphical geology of North-Western Europe and is the most useful available work of reference on the geology of the areas described. It will be of especial value in reference to the Hercynian mountains of Germany and Bohemia.

An important problem connected with these Hercynian blocks is whether they are remnants of the ancient crust of the Earth and had been converted into schists and gneisses in pre-Cambrian times, or whether they are Palaeozoic deposits that have been crystallized into metamorphic works by heat and pressure during the later Caledonian and Hercynian movements. Professor von Bubnoff supports their pre-Palaeozoic age and also the view that some of the sandstones and quartzites associated with them, instead of being Carboniferous as has been generally thought, are also pre-Palaeozoic. One of the famous test cases in this discussion is the Granulit-Gebirge of Saxony, which is one of the blocks of the Moldavian–Danubian series. Professor von Bubnoff adopts the pre-Cambrian age of the Saxon granulites.

The Caledonian structures are less complete than the Hercynian, except in Britain and Norway. The author uses the term Caledonian in its more extensive sense to include all the pre-Hercynian mountain movements. It was originally used for the middle Palaeozoic (Upper Silurian and Devonian) movements alone. The author's use of the term leads him to include under it an account of British geology up to the end of the Lower Permian. This section is interesting from its contribution to the correlation of the British and Continental deposits and the author's opinions on various controverted stratigraphical questions are the more weighty as they are based on an exhaustive study of the evidence. His correlation of the rocks is summarized in four elaborate folding tables. The chapters on the economic geology refer to the recent literature on the ore deposits. The author points out the enormous predominance of Germany and Silesia in coal reserves, since the Hercynian basins contain 87 per cent. of known European coal.

He gives an excellent account of the Scottish pre-Palaeozoic rocks upon which opinions differ on the primary facts. The chapter on the Caledonian geology of Norway shows the present stage of the long controversy over the correlation and the extent of overthrusting of its rocks. That extensive areas have been pushed eastward over younger rocks along flat thrust-planes like those in the north-west of Scotland was established by Törnebohm; but his claim that the movements were 100 miles wide has proved excessive. A more probable correlation of some of the rocks enables the facts to be explained by thrusts of about 10 miles, and they are free from the mechanical objections to the wider movements advocated

by Törnebohm. The literature upon the Hercynian mountains of Germany is unusually extensive and scattered, and this masterly digest of the results is a welcome contribution to European geology. The book though mainly of value as a contribution to stratigraphical geology will also be of service to those who need a comprehensive account of areas which have exercised a fundamental influence on the physical geography of North-Western Europe. J. W. G.

THE ARCHAEOLOGY OF MIDDLESEX AND LONDON. By C. E. VULLIAMY. (The County Archaeologies. General Editor, T. D. KENDRICK.) *London: Methuen & Co.* 1930. 8×5 *inches;* xx+308 *pages; illustrations, sketch-maps and plans.* 10*s* 6*d*

The need of this series, of which the present volume and one on Kent are the first to appear, under the general editorship of Mr. T. D. Kendrick of the British Museum, has long been felt by archaeologists and students of British antiquities whether in the field or the museum. Within the space of some 300 pages the author achieves a complete and sound archaeological survey of Middlesex, the Lower Thames, and the greater part of London, from the Old Stone Age to the Norman Conquest; from hundreds of pamphlets and various scattered sources he has made a careful collection and statement of facts and theories to date, and happily is in no undue haste to be certain, *e.g.* as to the date and purpose of Grim's Dyke or the London Stone. He gives what is wanted, a trustworthy and useful summary of the latest and best authorities. For Roman London he has the good fortune to be able to draw on 'London' (Victoria County Histories), vol. i (1909), and the 'Inventory' of the Royal Commission on Historical Monuments (1928), but not on the Commission's work on Middlesex, which is still in preparation. Roman London is well treated in two chapters (vii and viii) under the heads of History and Topography and Archaeology, and Middlesex in Roman times in chapter ix. A particularly useful feature is the archaeological gazetteers at the end, topographical lists, alphabetically arranged, of archaeological discoveries, with the chief references to authoritative descriptions. These county documented gazetteers should enhance the value of the O.S. map of Roman Britain, especially in cases where one can be fairly certain of the names of places indicated by dots, triangles, etc. Equally useful is a list of museums and collections containing Middlesex and London antiquities, with a selection of chief exhibits: such a list for the whole of Great Britain is a real desideratum. Following on Dr. R. E. Mortimer Wheeler's conclusions, Mr. Vulliamy assumes that "the ground upon which the City of London now stands was not permanently occupied . . . before the Claudian Conquest." Caesar, who passed close to it in 54 B.C., has nothing to say of the site. While we do not find in this book anything fresh about Londinium, we may congratulate the author on his judgment and caution. Roman Middlesex makes more interesting reading. Thus Sulloniacae (on Brockley Hill, but still uncertain as to exact position) has more attention paid to it than usual, the result of patient piecing together of unconnected records made at different times; and this is typical of the handling of many other places. It is strange that this one of the two Roman sites in Middlesex apart from London—Staines is the other—has never yet been systematically explored, in spite of an attempt in 1918 which failed for want of the approval of the landlord. On the question of a continued occupation of London by a Romanized or native population, Haverfield's view is accepted, that London "lay waste for a hundred years," to emerge at the end of the sixth century as the capital of the East Saxons, whose skulls, "distinctly deficient in width," according to Professor Parsons, mark them as of an inferior human type. The book is well illustrated. (Misprint: p. xiii, Collectanea Antiquua). S. E. W.

WILTSHIRE. By R. WELLDON FINN. (The Borzoi County Histories.) *London: Alfred A. Knopf* 1930. 8×5 *inches;* 120 *pages; illustrations and sketch-maps.* 3*s* 6*d*

The author of this handbook fulfils the aim of the Borzoi county histories in tracing the story of human settlement in Wiltshire from earliest to modern times. Enough also of the general history of England is given to enable the unlearned or even the lazy to fit the local into the national story. Certain passages indeed might be taken from an elementary text-book.

Because of its geographical factors Wiltshire has changed its outward aspect much less than most other English counties; its open, rolling, sheep-trimmed downs are still its glory. It possesses the most famous of ancient British monuments and noteworthy examples of the work of each succeeding age—as for example Salisbury Cathedral and the Swindon railway works. All this Mr. Finn brings out well, and his maps are valuable in tracing the periods of development. Those who know and love Wiltshire will be glad of the book, but they will wish that something more could have been given of the characteristics of its people; their legends, outlook, manner of life, and so on. Most Wiltshire folk are "horsey," but Mr. Finn has a line and a half only about the racing stables; some Wiltshire folk regard snails as a delicacy—Mr. Finn does not mention it; all Wiltshire chuckles over the story of the moonrakers—a medallion on the cover indicates its importance, but Mr. Finn is silent on the matter. All this however shows that the author has whetted our appetites. F. R. C.

RAMBLES IN EIRINN. By WILLIAM BULFIN. *Dublin: M. H. Gill & Son* 1929. (Eighth Impression.) 8×5 *inches;* xxiv+456 *pages; illustrations and maps.* 6*s*

William Bulfin, having spent many years of his life in South America, returned early in this century to his native Ireland. Full of an exile's idealistic patriotism, he at once became an extreme Irish-Irelander. In 'Rambles in Eirinn,' which was first published in 1907 and has now reached its eighth impression, he described his impressions of his native land, gained during a series of cycling excursions through the country. The book is written with eloquence and feeling, in an easy, colloquial style. But the hatred of England and of everything connected with England, which he found reasons for expressing on almost every page of the book, is now out of date, however useful it may have been in 1907; and much of what he wrote is therefore out of date too. As for the rest of it, what Bulfin saw as he cycled through Ireland was—apart from the footprints of England—all so uniformly lovely and noble and uplifting that it is of little use to the practical traveller. On political questions he employed an intelligent and fertile though prejudiced mind, but he drowned his topographical facts and his descriptions of places and monuments in rhetoric and sentimentality. His notes on the roads and scenery of some of the remoter districts may however be occasionally useful to motorists and walkers. As an historical document and as an expression of the mind of a patriot, the work is interesting. But this book is not a guide-book to any Ireland ever known to ordinary Irishmen. It is a vision, and a vision which only a state of war and the romance which once accompanied war could make really interesting. E. L.

THE THAMES VALLEY: A SURVEY. Prepared by the EARL OF MAYO, S.D. ADSHEAD, P. ABERCROMBIE, and W. HARDING THOMPSON for the C.P.R.E. *London: University of London Press* 1929. 13×10 *inches;* xvi+106 *pages; illustrations and maps.* 21*s*

This charming volume could hardly be bettered merely as a descriptive and pictorial guide-book to the Thames Valley; but it is much more than that. To

quote the title-page, it is a survey of its existing state, with some suggestions for its future preservation, prepared by the Earl of Mayo and Professors Adshead and Abercrombie, with the assistance of Mr. Harding Thompson, for the Thames Valley Branch of the Council for the Preservation of Rural England (C.P.R.E.). The area surveyed is that part of the valley from Cricklade to Staines "enjoyed by the residents and by those who follow the course of the Thames by road or water"; but the large towns of Oxford and Reading are excluded, though incidentally mentioned. In Part I, after a historical preface by Mr. John Buchan, the villages, bridges, existing communications of all kinds, industries, and landscape character are admirably described and most attractively illustrated by photographs, sometimes taken from the air, and by Professor Adshead's deft pen-and-ink sketches. The chapter on bridges alone is a delight; we are glad to find Brunel's great brick railway arches and Tiernay Clark's suspension bridge at Marlow receiving honourable mention. Part Two, entitled Recommendations, deals with existing disfigurements, methods of protection, treatment of low-lying lands, provision of by-pass roads, and every subject that comes under Town-Planning—a misleading word, because it embraces large tracts that are always likely to lie many miles from even a small town.

The C.P.R.E., while advocating the preservation of special areas as permanent open spaces, disclaims any idea of preventing all building in regions of natural beauty. Much of the Thames owes its attractiveness to riverside mansions and cottages, while even bungalows can almost justify their existence by gay little gardens. It is ill-considered and unregulated building, road-making, and advertising that ruin a countryside. There might, with advantage, have been more than one page of photographs illustrating typical disfigurements. It would indeed be difficult to beat that heart-breaking row of railway carriages on stilts bordering "the stripling Thames at Bablockhythe"; but the sugar-beet factory at Eynsham within sight of the noble Swinford Bridge deserved a place in the gallery of horrors much more than the chimney at Sandford Mill. Unstinted praise is given to the Thames Conservators; and we need not waste our sympathy on owners of bungalows which are submerged to the eaves in winter floods merely because they have been erected on land entirely unsuitable for building. The maps, on a scale of 2 inches to 1 mile, indicate land liable to floods, spaces that are permanently or temporarily safe from spoliation, and special areas to be preserved. It is a pity that some places mentioned in the text are not named either on them or on the otherwise excellent town-plans. J. H. R.

BURGUNDY, with chapters on the Jura and Savoy. By STEPHEN GWYNN. (The Kitbag Travel Books.) *London: George G. Harrap & Co.* 1930. 7×5 *inches; 284 pages; illustrations and map.* 7*s* 6*d*

Mr. Stephen Gwynn describes his travels with an engaging charm. "Here is what I have seen," he writes, "what I have enjoyed, and this is why I enjoyed it." One enjoys the personal touch and appreciates the historical settings; and certainly a perusal of these pages makes one want to set out for Burgundy, even if a fortnight be the limit of time available, though the author provides "ample room for a month's roving." The author, like the present reviewer, seems to have been puzzled by Les Laumes as the taking-off place for Alesia. The pages on Alesia are a good sample of the author's method: he takes pains (in ten pages) to put his reader thoroughly in relation with the history of the place and that grandiose Caesarean circumvallation of 10 miles. The chapter on Dijon (twenty pages) touches most of the points of interest of this beautiful old town. The chapter on the Jura is justified, as the district is comparatively little known to English visitors. S. E. W.

LE LITTORAL DU NORD DE LA FRANCE, ET SON EVOLUTION MORPHOLOGIQUE. By ABEL BRIQUET. *Paris: Armand Colin* 1930. 10×7 *inches;* 440+42 *pages; diagrams and maps.* 60 *fr.*

This volume makes a valuable addition to the literature, already immense, on shore-line topography. The author first deals with some general principles of shore-line development, but the main part of the volume is given to detailed studies of the Picardy, Boulonnais, and Flemish coast-lines. It is here that the general reader may be confused. The treatment is for the most part very detailed, and consequently, unless the reader has an intimate knowledge of, or a very particular interest in, this part of the French coast, he is likely to find this part of the book tedious.

The preliminary chapters, besides discussing certain general principles of shore-line development, also touch on the various oscillatory movements of sea-level which have left their traces on this coast. At the present time eustatic movements of sea-level are usually invoked to explain widespread occurrences of raised beaches, submerged forests, and allied phenomena. Briquet, whilst apparently favouring the eustatic hypothesis, is careful to note that "L'étude du littoral du nord de la France n'embrasse pas une aire suffisamment étendue pour que l'une ou l'autre hypothèse (*i.e.* epeirogenetic or eustatic) y puisse recevoir confirmation ou infirmation." But in general the levels at which raised beaches, etc., are found here are in accordance with those in Western and Southern Europe as well as England. Hence there is general support for eustatic movement.

There is not space here to follow his full sequence of events in the changes of sea-level. Suffice it to say that the earliest transgression with which he deals is the 35-metre, or Tyrrhenian (*Strombus* beds). This is associated with the Mindel-Riss interglacial period. Then follow the Monastirian (15-metre); the 5-metre level (=5–8 metres in the Mediterranean area); a transgression to which no name seems to be applied, but which the author labels in his table "Transgression marine de niveau voisin du niveau actuel?"; and finally the Flandrian and Dunkerkian transgressions, both of which are post-glacial. All these phases alternate with regressions.

The Flandrian and Dunkerkian oscillations present special points of interest. That the former is post-glacial is shown by the fact that the sediments deposited by it cover beds containing Mammoth. The transgression was a widespread phenomenon, and its traces occur over much of Western Europe: in Scandinavia it is represented by the Littorina sea. The Dunkerkian transgression is very recent, and from evidence in Brittany and elsewhere it would seem to be post-Bronze Age, and may have coincided with the closing stages of the Roman occupation of Western Europe.

It is interesting to compare the recent work of R. D. Oldham in the Rhone Delta (*Q.J.G.S.*, lxxxvi, 1930, 64–93) and C. J. Gilbert on Romney Marsh (Deuxième Rapport de la Commission des Terrasses Pliocènes et Pleistocènes, Int. Geogr. Conf., Cambridge 1928), in this respect. There is a great deal of very interesting work to be done on these recent "historical" oscillations of sea-level, extending probably into mediaeval times.

The main body of the volume deals with details of selected areas. Many interesting points of evolution of sand and shingle spits, of reclamation of marshes, etc., are described. The author also works out very fully, in the case of certain estuaries, the development of a "poulier" on that side of the estuary from which the strongest tidal currents come. The name "poulier" is used to denote "le dépôt formé dans le chenal d'un port par les matériaux qui, entraînés par le courant littoral de long de la côte, ont contourné l'extrémité de la jetée." It seems first to have been used by de Lamblardie for similar features. On the opposite

side of many such estuaries is the "musoir," a word which the author uses in the absence of any technical term. The "musoir" is constantly attacked by the sea, and steadily retreats, thus providing material which is carried into the estuary and helps to silt it up. In a general way the dominant wind on this shore acts with the flood current and so "Il ajoute également à l'effort du flot par les vagues qu'il soulève; il concourt ainsi, à tout moment de la marée, à accroître l'avancée des pouliers appuyés sur l'un des côtés des estuaries, à provoquer le recul des musoirs situés du côté opposé." Naturally the mode of development of "pouliers" and "musoirs" will vary with the complexities of particular estuaries.

These discussions are usually accompanied by plans and maps, so that the reader can see clearly how development has proceeded. The author has been at pains to collect a great amount of historical material, and the student will find it useful carefully to read such parts of the book to appreciate the value of this evidence. Similarly, geological and historical evidence is detailed in the accounts of the formation of the maritime plains of Picardy and Flanders.

In an appendix, which really forms an independent paper, the human aspect of the development of this stretch of shore is traced, and there is an interesting chapter on the nature of historical evidence, attention being given to the value in this connection of old maps and documents.

The book is well illustrated with maps and diagrams, and contains a useful bibliography and list of cartographical references. It suffers from a defect common to many foreign books—it has no index, though this is partly remedied by a full "Table des Matières." J. A. S.

MASSALIA: Histoire de Marseille dans l'Antiquité, des origines à la fin de l'Empire Romain d'Occident (476 ap. J.-C.). By MICHEL CLERC. Tome II. *Marseille: Librairie A. Tacussel* 1929. 11 × 8 *inches; 490 pages; illustrations and plan.* 20*s*

M. Clerc concludes his task of securing historical justice for a city with a history but no historian, and with a University but no Ausonius.

His first volume (see *G.J.*, 74, 1929, pp. 394–397) broke off at the period, in the fourth century B.C., at which the political influence of Marseilles reached its apogee. This second volume tells first the story of the political decline during which the city sank from being the ally of the Roman state to a position as favoured client, at first of the state, and, later, of the politicians of the last years of the Republic. Material prosperity rose meanwhile, based insecurely on the goodwill of these politicians, but the weakness of the position was shown up during the siege by Caesar's lieutenants, when a city for whom command of the sea was everything was defeated by a scratch Roman fleet built hastily in one month at Arles, and with the collapse of the resistance to Caesar everything came to the ground. The Ionian character remained nevertheless sound—the desperate resistance offered for six months to the attacks of Caesar's legionaries by land attests the fact—and, under the Empire, Marseilles gained a new reputation as a teaching centre, where Greek *comitas*, in the phrase of Tacitus, was happily combined with a provincial austerity of manners. Before the close of the Empire Bordeaux, which did have an Ausonius, took over the task of higher education in Southern Gaul, but some of the Greek tradition must have survived at Marseilles until the end, for she is still a Greek enclave in the Peutinger Tables, *Massilia Graecorum*, looking out on the *Mare Graecum*.

As before, M. Clerc deals faithfully and exhaustively with the meagre references to Marseilles in the classical texts, and with the inscriptions, coins, and other archaeological remains which are the fragile controls of the historical imagination. Again the setting of Marseilles is shown, in a Roman world this

time, hardly even a Graeco-Roman world except in so far as the city herself contributed a Greek element. Frequent comparisons too with the mediaeval and modern conditions extend our view to the interplay of politics and geography over the whole 2500 years of this unique history, during which the city comes up again like the phoenix from each period of decline to an important place in the Mediterranean world. Roman policy has favoured at her expense the inferior ports of Narbonne, Arles, and Fréjus; with the fall of Rome geography begins again to operate in favour of Marseilles. Nevertheless, on the landward side, geography seems to have done nothing to reverse the sentence of Caesar, and M. Clerc, who has a wholesome dislike of Caesar's character (and veracity—"Did Caesar Lie?" is his attitude to the Commentaries), even ascribes certain anomalies in the political position of Marseilles to-day in the Department of the Bouches-du-Rhône to the settlement of 49 B.C.

This volume includes also the whole discussion of the topography of Massalia, which falls quite naturally under the siege by Caesar because the author's argument for the reconstruction of the perimeter of the Greek city is based principally on the circumstances of that siege. Since the streets were under clear observation from the main camp of the Romans, and since this camp stood on a hill at the same height as the Acropolis, separated from it by a valley narrow enough to be bridged by an *agger*, it is impossible to place the Roman camp on the outer line of hills included in the present town, from which the view of the streets would have been masked and which would be at an impracticable distance (450 metres) from the nearest hill of the inner line, the Butte des Carmes. The main Roman camp stood then on the Butte des Carmes itself, and the ramparts of Marseilles enclosed of this inner line only the Buttes de St. Laurent and des Moulins; the modern Rue du Planier represents their western sector. It follows that the area of Greek Marseilles was only about one-third of the 75 hectares usually ascribed to it; nevertheless, this area was still, in 1911, adequate to house fifty thousand of the inhabitants, and nothing indicates that the population of the Greek city was much, if at all, larger than that. Here is a pretty topographical argument for the scholars to deal with; they will probably dislike the conclusion to which it leads.

Another line of argument leads to the suggestion that the ancient network of streets is still distinguishable in its broad lines in the corresponding part of the modern town. The Grand' Rue, which is the axis of the lower town to-day, was the *Via Recta* of the Middle Ages; a street with this name is usually of Roman date, leading out to one of the great Roman roads. But, if the street dates back to the Roman period, why not to the Greek, since there is no trace at Marseilles of the sumptuous monuments in the Roman style common in other French towns, and no reason to believe that the Roman period saw any internal changes of importance? Thus the Grand' Rue may well have been from all time an axial line; at its western end the Place de Lenche may have been the agora of the first Phocaean settlers, and the Place des Accoules, in the centre, the general agora of Massalia in its prime. However much private convenience has broken, throughout the centuries, into the regularity of pattern of the ancient town, what M. Clerc calls "la nature du terrain" has always imposed itself, and the pattern has not been completely destroyed. As we see, geography has not been mocked at Marseilles, either inside the city or out. R. A.

GÉOGRAPHIE UNIVERSELLE. Tome III. Belgique. Pays-Bas. Luxembourg. By A. DEMANGEON. (Edited by P. VIDAL DE LA BLACHE and L. GALLOIS.) *Paris: Librairie Armand Colin* 1927. 12×8 *inches; 250 pages; illustrations and maps.* 60 *frs.*

In this volume, as in his 'Iles Britanniques,' the first of the series, M. Demangeon exerts his great art of description. No one better than he can express in a few

words the essence of a scene, of an industry, the atmosphere of an industrial region or of a rural landscape. And nearly always he is able with the same apparent facility to indicate the main controlling geographical factors behind the various conditions and activities that he describes.

Nothing is more difficult than to write a comprehensive geographical study of a political unit. And M. Demangeon has three political units to deal with in this volume. He has chosen the only method that does not present almost insurmountable difficulties: that of treating his subject in a series of short essays and sketches which have a more or less logical connection. One could wish that he had not adopted the habit of quoting long strings of place-names, particularly of towns with their respective populations in brackets, tied together by some such expression as "jolies bourgades." He might better have devoted more space to explanation and correlation. Not that a strictly logical treatment is lacking in the more important parts of the book and, in an advanced study such as this, to give a large proportion of space to characteristic features such as the age-long struggle against the waters of sea, river, and swamp, which occupies a chapter by itself, is right. The chapter on Belgian industries might have been accorded more importance as far as space is concerned, and the subject lends itself to a more analytical treatment than it has received. The book however was written before conditions had really begun to stabilize themselves after the War, and the author has perhaps been wise in neglecting the effects of that tremendous disturbing factor. It will be interesting to note the changes he will have to record in the next edition of the work. The photographs are both beautiful and illuminating; the maps are less adequate for the guidance of the reader and the illustration of the text. But no doubt the author expects, as he has a right to, that the reader will have before him the relevant large-scale maps referred to in the bibliography at the end of each section. H. O.

ALLGEMEINE WIRTSCHAFTSGEOGRAPHIE: Einführung und Grundlagen. By RUDOLF LÜTGENS. *Breslau: Ferdinand Hirt* 1928. 9×6 *inches;* 216 *pages; diagrams and maps. M.*8.50

From his position at the University of Hamburg, in close touch with the economic life of Germany's greatest port, from his wide travels and wide reading, Dr. Lütgens has been able to illustrate most admirably by practical examples the multiple geographical controls and influences that may be exerted on economic development.

His book is divided into three sections. The first deals with the influence of physical conditions, the second with the significance of the plant and animal world in the life of economic man, and the third with the reaction of man to his geographical environment. There is a rich accompaniment of valuable maps and diagrams, each provided with illuminating notes. This is fortunate, for the inevitable drawbacks of a book that covers so large a field of knowledge are a superficiality of treatment and a tendency to supply uncorrelated facts. A compensating stimulus to further investigation is however provided by an excellent bibliography. H. O.

DOWN THE TIBER AND UP TO ROME. By H. D. EBERLEIN, G. J. MARKS, and E. A. WALLIS. Illustrations from drawings by FRANK A. WALLIS. *London: J. B. Lippincott Company* 1930. 9×6 *inches;* 208 *pages; and illustrations.* 15*s*

The authors of this book carried out an original idea which should arouse interest even in the most jaded reader of Italian travel books. Few tourists know anything of the Tiber, except in the neighbourhood of Rome, and it is hardly a stream that would invite one to venture upon it in a rubber canoe. The authors had intended

to begin their trip at Borgo San Sepolcro, but the season was so late that there was not sufficient water there, so they started at Perugia instead. Their book however begins with a preliminary chapter upon the upper valley, which some of them had visited on foot. One has but to glance at a map to realize how out of the way of any but the most enthusiastic and indefatigable traveller the Tiber valley really is until it reaches Orvieto. Those interested in the river as a waterway should turn to chapter xii in this volume. The Tiber is not considered navigable above Orte owing to rapids, and it is now very little used as a waterway. The writers had trouble enough with the rapids and they appear to have been lucky to get through the Forello, below Todi, so easily. Indeed, in any other kind of boat they would probably have come to grief many times.

The book is written in a popular style, but the writers have keen eyes and can describe unpretentiously, as in their account of Torgiano. Even Baedeker treats most of the region they visited in rather cavalier fashion. One gets a little tired however of the many duckings and other similar adventures. L. C.-M.

SARDINIA: the Island of the *Nuraghi*. By DOUGLAS GOLDRING. *London: George G. Harrap & Co.* 1930. 9×6 *inches; 270 pages; illustrations and map.* 15*s*

Sardinia has been somewhat neglected by English writers of recent years, though an interesting article by Professor Guido Costa appeared in 1923 in the *National Geographic Magazine*, and D. H. Lawrence's 'Sea and Sardinia' was published shortly before. Though it can hardly be said to rival either of these in description, Mr. Douglas Goldring's work is very much more informative and useful. The author, who was fortunate in having friends on the spot, seems to have visited nearly all the places of importance, and calls attention to the particular phases of life that each exhibits. There is also much useful information about hotels and roads, but, as he used a car, not much about the railways. Though the subtitle of the book is 'The Island of the Nuraghi' there is comparatively little about these curious archaeological features. In fact one would welcome a little more detail as to their whereabouts apart from the two districts mentioned. Mr. Goldring does not attempt to solve the problem of their origin, but inclines to the theory that they were "designed as secure places of abode."

The book is very readable and excellently illustrated. The information appears to be quite accurate, though one might mention that the ruins of the supposed house of Christopher Columbus at Calvi, Corsica, were still visible in April 1930. As with increased facilities and better hotel accommodation it seems probable that Sardinia in the future will attract more English tourists, this work ought to supply a real want in travel literature. But it should be noted that April and May are the best months for a tour, and that those who expect to find the winter climate equal to that of the Riviera will be disappointed. A. W. S.

THE HANDBOOK OF PALESTINE AND TRANS-JORDAN. Edited by H. C. LUKE and E. KEITH-ROACH (with an Introduction by Sir JOHN CHANCELLOR and the Rt. Hon. Sir HERBERT SAMUEL). *London: Macmillan & Co.* 1930. (2nd edition.) 8×5 *inches;* xvi +506 *pages; and map.* 16*s*

This is a second, and considerably enlarged, edition of 'The Handbook of Palestine' issued in 1922. As is noted by Sir John Chancellor in his preface to this edition: "the Authors have not only brought up to date the information contained in the first edition, but have added much new material describing the developments that have taken place within the last few years. In particular, they have added a new Part dealing with Trans-Jordan, which will supply the long-felt want for authoritative information on that country."

All the prominent specialists in Palestine appear to have been co-opted in the production of this excellent handbook. It is a veritable mine of information, much of which is only obtainable with difficulty elsewhere. The sections dealing with Archaeology, Government and Government Activities, Commerce, Geology, Mining, and Natural History are particularly important, as the information here is from official sources and is thoroughly up to date. The book does credit to the Editors, but it also bears high testimony to the efficiency of the Administration. No one interested in the history, resources, and development of the Holy Land can afford to neglect this work. The map exhibits the physical features, the boundaries, the main roads and railways, and the sites of towns, antiquities, and battles. E. W. G. M.

AROUND THE COASTS OF ARABIA. By AMEEN RIHANI. *London: Constable & Co.* 1930. xii+364 *pages; illustrations and maps.* 21*s*

The author, an American man of letters, inspired by the pages of Burton and Doughty to travel in Arabia, embarked early in 1922 on a periplus of the Arabian Peninsula, starting from Suez in February and bringing his journey to an end at Koweit, at the head of the Persian Gulf. He is giving us an account of his travels in separate instalments. The first, entitled 'Ibn Sa'oud of Arabia,' was published in 1928 and dealt with the second half of his journey; more particularly, as the title indicates, with his visit to that distinguished potentate (see *G.J.*, 71, 1928, pp. 592–594). Under the appropriate title of 'Round the Coasts of Arabia' the author now writes of another section of his travels, dividing his narrative into five sections: (i) With King Husein in the Hejaz; (ii) With the Idrisi in Asir; (iii) The Shaikhs of Koweit; (iv) The Shaikhs of Bahrein; and (v) Aden and the Protectorates.

In his Tramp Abroad Mr. Rihani was admittedly in search of "copy" for a book, and for the superficial reader the resulting volume is an entertaining book of travel, enlivened with some good stories and clever word pictures and character sketches. But the more sophisticated reader must needs dive deeper, and while ready to note and to give the author all credit for his occasional disposition to give the devil his due—take for example the well-deserved tribute which he pays to Dr. Fadhl-ud-Din—yet he will regret to find, running through the narrative, the same vein of malevolence towards British policy and British officials as was so noticeable in his previous volume, and a too great readiness to accept for purposes of "copy," material or evidence of facts not always reliable. Of bad taste in writing it would be difficult to find a more conspicuous example than his references to the Political Agent at Bahrein and his wife on p. 258, and like those of his fellow-countryman Dr. Jabez Sunderland, author of 'India in Bondage,' his samples of "history" cannot be satisfactorily dealt with in a short review; but at any rate the reviewer feels constrained to suggest that the so-called "Arabic Document" with which Mr. Rihani makes such play when recounting his conversations with King Hussein (p. 112), reads uncommonly like a figment of the brain of that Royal personage or one of his suite, and needs treating with all reserve. P. L. C.

REPORT ON PROGRESS IN MANCHURIA, 1907–1928. *Dairen: The South Manchuria Railway Company* 1929. 12×8 *inches;* viii+238 *pages; illustrations, maps, and plans*

The modest title of this volume does not adequately cover the wide range embraced by its contents. It might be more accurately described as an economic geography of Manchuria, with a sketch of the economic and political history of the country since the Russo-Japanese War. The South Manchuria Railway Com-

pany ranks second in point of mileage to the Chinese Eastern Railway Company which serves Northern Manchuria. But the South Manchuria Railway controls also the port of Dairen, the principal outlet of the whole country. It is of course a Japanese company, financed by Japanese money, and which has invested the stupendous total of over sixty million pounds sterling in Manchuria. An interesting estimate is given of the total investment of Japan in Manchuria as two thousand million yen, or £200,000,000. This great company is far more than merely a railway company, and the part it plays in South Manchuria may be likened to the part played by the Canadian Pacific Railway in the opening up of Canada. Only a little over a third of its investments are actually in railways; municipal undertakings, coal mines, iron works, and other items take a very high place. Naturally a report such as the present seeks to justify Japanese activities in Manchuria. It is "a territory which is increasingly becoming the chief granary and source of raw material for Japanese industry." It is interesting to notice that the emphasis is no longer placed on the importance of Manchuria as a field for Japanese settlement. The Japanese farmers' hatred of the cold winters has really settled that matter. Emphasis is placed rather on the benefit which is conferred on China by providing a well-ordered and a well-policed country where her people can settle in peace. Certain figures are given of recent immigration to Manchuria; in the four years 1923–1926 inclusive over 2,000,000 Chinese arrived, whilst in 1927 nearly 1,200,000 came into the country. Of these immigrants a steadily increasing proportion remain permanently.

The report deals with the whole country, and discusses with commendable impartiality the work carried out by other countries interested in Manchuria. In some directions the expansion is almost incredible. The first shipment of Manchurian soya beans was made in 1908; less than twenty years later, in 1927, the production in Manchuria was estimated at 190 million bushels, of which a very large proportion were exported. Indeed the report deserves detailed study by all who are interested in Far Eastern political and economic affairs; for in the words of p. 4: "Japan would not be doing her duty in allowing Manchuria to become involved in any serious disturbance of tranquillity," and it may be regarded as certain that Japan will strive to the uttermost to maintain her economic hold on the country, which, it is pointed out, is especially of benefit to the Chinese concerned. L. D. S.

BY WAY OF THE SAHARA: the African Odyssey of Three Men and a Grocers' Van. By OWEN TWEEDY. *London: Duckworth* 1930. 9×6 *inches;* 248 *pages; illustrations and sketch-maps.* 12*s* 6*d*

Those who heard the brief but witty account of his journey across the Sahara in a grocer's van given by Mr. Tweedy at a meeting of the Society some months ago (*G.J.*, 75, 1930, pp. 2–15) will not be disappointed in this entertaining little volume. The author travelled as the companion of Captain Richard Crofton, who provided a Zanzibari servant and a Chevrolet van. Starting from Rejaf on the Nile they travelled westwards through Buta and Fort Archambault to Lake Chad, where they entered British territory and began to experience bad roads. Crossing Nigeria by Kano and Sokoto they reached Gao on the Niger without serious misadventure. Their intention had been to follow the Niger to Timbuktu, but as the road was closed by sand they decided to make straight for Algeria by way of the Sahara. Quite undaunted by the fact that no vehicle could have been more unsuitable than their grocer's van for such a hazardous enterprise and with the wheel tracks of the Juggernauts of the French Trans-Saharan Company as their only guide, they set out full of confidence. Although they eventually won through successfully they came very near to disaster and were a source of con-

siderable anxiety to the French authorities. They suffered a great deal from exposure to extremes of temperature, but this was less serious than the intense strain of having constantly to dig their van out of the sand into which it was always sinking. Mr. Tweedy's account of this part of the journey is entertaining reading and makes light of their hardships, but it is evident that men of less determination might easily have succumbed. Not the least pleasing features of the book are the author's admiration of the skill and resourcefulness of Captain Crofton and the extreme humility of his references to himself. E. W. B.

PALEOLITHIC MAN AND THE NILE-FAIYUM DIVIDE: a study of the region during the Pliocene and Pleistocene times. By K. S. SANDFORD and W. J. ARKELL. (Oriental Inst. Publ. Vol. X. Prehistoric Survey of Egypt and Western Asia. Vol. I.) *Chicago: University Press* 1929. 12×9 *inches;* xvi+78 +xi *pages; illustrations and map.* 22*s* 6*d*

This extremely valuable study of the Faiyum region of Egypt is one of a series of papers and memoirs published during the past two or three years by the enthusiastic and highly trained specialists whose intensive researches into the more recent geology and prehistoric development of the Nile Valley have been instigated and made possible by the Oriental Institute of the University of Chicago, the British School of Archaeology, and the Geological Society of London. A notable advance in our knowledge of the post-Miocene history of the country is registered by the work of Messrs. Sandford and Arkell, Miss Gardner, and Miss Caton-Thompson, and has been welcomed by none more than by the officers, past and present, of the Geological and Desert Surveys of Egypt, whose work is of necessity largely occupied by, if indeed not restricted to, questions of economic interest.

A far larger portion of Egypt than is indicated by the title is dealt with in this memoir. Professor Breasted contributes a foreword and refers to the fact that several problems connected with the geological history of the Nile Valley, of the greatest importance to archaeologists, had previously been left unsolved. One might even go further and affirm that on some questions entirely erroneous conclusions had been drawn. Professor Breasted remarks that even the fundamental question of the origin of the Egyptian portion of the Nile Valley has only recently been settled in favour of erosion. Erosion guided by faults, fractures, rifts, and folding is, we suppose, now almost universally admitted; but erosion alone, uninfluenced by important earth movements, fails to explain, among other things, the remarkable bend of the valley at Qena, the almost entire absence of outliers or "islands" within the trough, the extraordinarily straight course of the valley between Assiut and Cairo, and the marked dissimilarity of the desert borders on either side along that stretch.

The critical examination of the country recorded in the memoir deals with the history of the Nile Valley and Faiyum from the Pliocene period, through the successive stages of the Pleistocene—represented by a series of terraces containing flint implements of Chellean, Acheulean, and Mousterian types—and carries us down to Neolithic times and the renowned Lake Moeris, so carefully studied by Miss Caton-Thompson and Miss Gardner. The discovery and elucidation of these successive beach-gravels, and the tracing of the Mousterian or Middle Palaeolithic terrace from the Nile Valley through the Hawara channel into the Faiyum, is an accomplishment on which the authors are heartily to be congratulated. The large amount of detailed investigation involved can only be appreciated by actual perusal of the report, which is amply illustrated by sections, natural-size drawings of the artifacts, some admirable photographs, and a map of the Faiyum and adjoining country on a scale of 1 : 150,000.

In so far as it deals with the transitional period from Palaeolithic to Neolithic times the work of Sandford and Arkell overlaps that of Miss Caton-Thompson and Miss Gardner, and in some cases the conclusions arrived at by the respective authors are not in accordance, more especially as regards the sequence of events between the deposition of the 25-metre lacustrine terrace and the succeeding Neolithic lake-border settlement at 19 metres above sea-level. The authors of this memoir reject the view that during this period the Nile lost contact with the shrinking Faiyum lake and that the latter dried up, exposing the old lacustrine deposits to prolonged and deep erosion during a period of desiccation; postulating that connection was maintained, that there was reversal of drainage from the Faiyum to the Nile, followed by aggradation and re-flooding of the depression by the river in Neolithic times. Other major differences of opinion concern the date of the incoming of desert conditions and the mode of erosion of the depression, ascribed by Sandford and Arkell in the main to normal river action (*Nature*, April, 1928, p. 670; *Man*, April 1929, pp. 66–69), a view vigorously opposed by Miss Gardner (*Geographical Journal*, 74, 1929, pp. 371–383. *Cf. Ibid.*, pp. 578–584). These differences of opinion are all to the good, as they will inevitably lead to further investigation of an area which still holds the key to some very perplexing problems. Probably nothing is of more importance than a determination of the altitude of the bed-rock below the alluvium in the Hawara channel, and this, I suggest, could easily be ascertained by shafts or bore-holes.

In conclusion, the present writer wishes to acknowledge the frequent references made by the authors to his own work on the Faiyum, carried out some twenty-five years ago, and to record his appreciation of their recognition of the difficulties and limitations met with by the pioneer workers in Egypt, who were frequently called on to examine, map, and report on huge areas of country in a single season. H. J. L. B.

LE ROYAUME D'ARDA ET SON EVANGELISATION AU XVII[e] SIECLE. By HENRI LABOURET et PAUL RIVET. (*Paris: Trav. et Mém. Inst. d'Ethnologie, vii.*) *Paris: Institut d'Ethnologie* 1929. 11×7 *inches;* 62+xviii *pages; illustrations, maps, and facsimile text.* 30 *fr.* (*Etranger* 45 *fr.*)

This short monograph describes a Capucin mission sent out to Arda on the Dahomeyan coast of West Africa by Philip IV of Spain in 1658. As they had gone out at the special request of the King of Arda the missionaries expected to find him and his people eagerly awaiting baptism and were bitterly disappointed to discover that quite other motives had prompted the invitation. After spending a miserable year in fruitless efforts to secure converts they were forced to return to Spain.

The document on which this work is based was for long believed to refer to an obscure Indian tribe of the Amazon, and the mistake was only recently discovered by the late Maurice Delafosse. The monograph contains notes on the Arda language and is well illustrated. E. W. B.

AFRICA'S DOME OF MYSTERY. By EVA STUART-WATT. Preface by Rear-Admiral Sir H. H. STILEMAN. *London: Marshall, Morgan and Scott* 1930. 10×7 *inches;* 214 *pages; illustrations and maps.* 10*s* 6*d*

The title gives little clue to the subject of this book, which is a description of Mount Kilimanjaro written by a mission lady who comes of a family that settled in East Africa in the early nineties. Why Kilimanjaro should be described as a "Dome of Mystery" is not disclosed and perhaps the inquiry had better not be pressed. The work is fluently written, but is, as might perhaps be expected, characterized by a voluble fervency which causes distrust and as an addition to

our knowledge of the mountain it is of slight interest. It claims, for instance, to be the first descriptive history of the Wa Chagga, a statement which ignores the careful study of these people published by the Hon. C. Dundas in 1924. To a systematic observer of African natives, the whole account has an air of unreality. Her natives rarely make a simple statement, and we are asked to believe that they use a diction which is evidently framed on the Old Testament. This literary device may sound more attractive to a section of the British public but it rings untrue to those who have been in intimate contact with African natives.

The author is pessimistic as to the effect of British rule in that part of Tanganyika Territory which she knows and is even inclined to blame the efforts of the Government to educate the people. Apparently they are to be denied anything but religious instruction of the type the author favours, and it is curious to read that "an African is at his best in all respects as a servant." Can she contemplate a whole race in domestic service? The fact is that Tanganyika Territory to-day is suffering from the change of masters: the reaction after the stern régime of the Teuton, partially due to our milder rule, has proved too much for some of the more turbulent elements and the tendency to disorder must be severely discouraged. The scheme of governing the tribes through the native authorities, now in vogue in the Territory, is excellent; but as during the German régime the power of most of these authorities was either suspended or broken, their prestige and habit of ruling became greatly atrophied. It is said that on the whole they are justifying the trust imposed and are rallying to their duty, so critics will be well advised to suspend judgment for a time, for if the plan does succeed we are building on a sure foundation. The author's limited experience in one corner of the Territory must not be taken as a measure of the situation as a whole. C. W. H.

THE ECONOMIC ASPECTS OF NATIVE SEGREGATION IN SOUTH AFRICA. By JOHN KIRK. *London: P. S. King & Son* 1929. 8×5 *inches;* x+148 *pages.* 6*s*

Many white South Africans have in the past based their views on the native question on racial and sentimental grounds, and there has been an unwillingness to face the facts. That phase is passing, and an encouraging sign has been that a number of the younger University men have turned their attention to the subject. Mr. Kirk's monograph is one of the results. Its subject is the economic effect of segregation. In a book of moderate dimensions Mr. Kirk's essay gets to the crux of the question. It can be stated very briefly: the Bantu cannot live on the reserves he has, and the proper disposal of his labour is of paramount importance. He is a conquered man and suffers from a sense of inferiority. He readily absorbs European vices, but physiologically, if not biologically, he is different from the European, and needs to be protected from "civilized conditions." He is even in danger of declining in numbers. Is there any hope of his salvation? Christianity and education—which are increasing among the Bantu—tend to remove the inferiority complex, but their spread cannot, it would appear, solve the economic problem. Mr. Kirk shows clearly the evils which now exist. He rightly rejects one proposed solution—complete segregation of the two races—which would be in fact an almost impossible task, as well as undesirable, but he finds grounds for hope in "possessory" segregation. That is, more or less, one of the aims of General Hertzog's Native Bills. For this "possessory" segregation the author makes a good case. For that case the book itself must be consulted—and it is well worth study. Here it is only necessary to say that "possessory" segregation means separating the natives from the whites in respect to land—giving him certain areas, larger than the present reserves, which shall be his inalienable property—but not segregating him in respect of labour. The essence of this policy is to prevent the

natives from becoming a landless race; to give them better means of developing the reserves; to make them better cultivators of the soil and, eventually, not a poor imitation of the European but better Bantu. F. R. C.

THE FUR TRADE IN CANADA: an Introduction to Canadian Economic History. By H. A. INNIS. (With a preface by R. M. MACIVER.) *New Haven: Yale University Press* (*London: Humphrey Milford*) 1930. 10×6 *inches;* 444 *pages.* ($5.00) 22*s* 6*d*

Professor R. M. MacIver, who contributes a preface to this book, states that it may be regarded as an introduction to the analytic study contained in another volume 'The Fur Trade of Canada,' by the same author, published at Toronto in 1927. He adds that it is however complete in itself and is an interpretation of the historical record of a primary industry, and thus a contribution to the economic history of Canada. It is based mainly on a study of the original historical documents, but the author has also made himself personally familiar with the fur trade territories of Canada.

A short Introduction, dealing with the beaver as the animal which played the chief part in the development of the Canadian fur trade, is followed by four long sections in which the history of the industry, from the beginning of the French régime to the present time, is discussed. These constitute the bulk of the book, and lead up to a final section setting forth the conclusions which may be deduced from the historical facts. A series of appendices and an index complete a volume which forms an important addition to Canadian literature.

Naturally it is the concluding section which is of most general interest, while much of the volume is chiefly of value as a work of reference and is far from easy reading. It is largely made up of quotations, which often appear longer and more numerous than the facts which they contain justify, and there is only one map, which is placed near the end of the book, and is not mentioned in the Contents nor, so far as we have found, in the index. It is on a small scale and is practically of no value as an aid to the comprehension of the earlier chapters, which deal in much detail with the struggle for control of the routes leading to the interior. In this connection we may note a curious allusion on p. 44 to "the low heights of land which separated the tributaries of the St. Lawrence from the rivers of the Atlantic—the *Richelieu* and the Hudson" (the italics are ours). This is doubtless a mere slip, but it does seem to indicate the danger of divorcing discussions of this kind from close and careful map study and map illustration.

As contrasted with the detailed historical survey the concluding section contains a number of striking generalizations of much interest. A quotation may serve to indicate their scope, but the whole section is one of great importance to the student. "The northern half of North America remained British because of the importance of fur. . . . The continent . . . became divided into three areas: (1) to the north in what is now the Dominion of Canada producing furs; (2) to the south in what were during the Civil War the secession states producing cotton; and (3) in the centre the widely diversified economic territory including the New England States and the coal and iron areas of the middle west demanding raw materials and a market. The staple-producing areas were closely dependent on industrial Europe, especially Great Britain. . . . The cotton-producing area was forced after the Civil War to become subordinate to the central territory just as the northern fur-producing area, at present producing the staples, wheat, pulp and paper, minerals and lumber, tends to be brought under its influence. . . ." "Canada emerged as a political entity with boundaries largely determined by the fur trade." M. I. N.

THE PROVINCE OF NEW BRUNSWICK, CANADA: its Natural Resources and Development. By L. O. THOMAS. *Ottawa: Department of the Interior* 1930. 10×7 *inches;* 168 *pages; illustrations and maps.*

The Department of the Interior of the Dominion of Canada has now begun to issue handbooks of the various provinces wherein are described their natural resources and development. One of the first of these deals with the Province of New Brunswick. There are chapters on the Farm Lands and Farming as well as on the Forests, the Fur-Bearing Animals, the Minerals, Fisheries and Water-Powers. There are also maps showing the geology and distribution of various economic factors. Of late New Brunswick has been receiving a number of agriculturists and information is here given of the best lands still available and how to obtain them. The climate of this province is so congenial both in summer and winter and the mixed farming so attractive that it should afford a valuable field for intelligent farmers. Visitors will find much to admire, including the reversing falls at St. John, of which there is a picture on p. 145. One of the chapters is devoted to the "Recreational Resources" of the whole Province.

It may be noted that the historical introduction is inaccurate in stating that a journal was published by the first settlers in Dochet Island. The journal in question was published not in Canada but in Paris. H. P. B.

HISTORY OF ALASKA. By H. W. CLARK. *New York: The Macmillan Company* 1930. 9×6 *inches;* x+208 *pages; illustrations and maps.* 10*s* 6*d*

A good deal has been written on Alaska since the closing years of last century, including the histories by H. H. Bancroft and W. H. Dall and the handbook by A. W. Greely, but nevertheless there is room for this brightly written volume. The difficulty in all Alaskan history is to trace the records before the days of the United States purchase and especially before the Hudson's Bay Company showed any interest in the region. Earlier records are of course in Russian and are not easily available. Mr. Clark attempts to bridge this gulf between discovery and American occupation, but admits the want of adequate documents. His work is particularly valuable in respect of recent times and he treats fully the boundary disputes over the Alaskan "pan-handle" and the Pribilov islands. There is much geography in the chapters on the gold rush, economic development, and modern conditions, but the chapter that purports to treat of geography and climate is not the happiest. We cannot admit that an accurate idea of the climate is to be gained from the mean annual temperatures of various places, nor is it wholly correct to say that the great controlling element in Alaska's climate is the Kuro Siwo, or Japanese current. More stress should be laid on the amount of cloud in the coast climates. These however are small matters and Mr. Clark does much to remove the current fallacies regarding Alaskan climate and productiveness. In the chapter on exploration the claim of Deshnev to have passed through Bering Strait in 1648 is discredited, and to Bering is given the honour of discovering Alaska in 1741. There are several sketch-maps and some well-chosen illustrations. R. N. R. B.

INDIANERLAND: Bilder aus dem Gran Chaco. By HANS KRIEG. *Stuttgart: Strecker und Schröder* 1929. 9×6 *inches;* viii+140 *pages; illustrations and sketch-map. M.*6.50

In contrast with the comprehensive works common enough from the pens of German writers, this book is a severely condensed and lightly written account of a journey whose main purpose was nevertheless scientific. In keeping with some German travel books however it lapses in places into a peculiar sentimentality which appears trivial and needless.

The author has here adopted a manner of writing which is intentionally

arresting and modern, the impressionist effect being heightened by means of a number of pen-and-ink sketches. It has clearly not been his intention to write a scientific treatise, but to present a series of selected pictures of the Chaco region which taken together will enable his readers to see it as he saw it, to feel its atmosphere, to enter into the subtle individuality of native Indian and of wild beast. The book is rather disconcerting at first, but as one proceeds it grips one's attention through an emotional appeal rather than through intellectual interest. The method employed, of giving a succession of apparently disconnected sketches, evidently has its uses in geographical description, though it could not be so readily applied to impersonal subject matter drawn from the inanimate world of nature. Altogether Hans Krieg's 'Indianerland' is an interesting and not unsuccessful experiment in a special method of presentation. E. W. S.

PROBLEMS OF THE PACIFIC, 1929. Proceedings of the Third Conference of the Institute of Pacific Relations, Nara and Kyoto, Japan, 1929. Edited by J. B. CONDLIFFE. *Chicago: The University of Chicago Press* (*London: Cambridge University Press*) 1930. 10×7 *inches;* 698 *pages; diagrams and maps.* 22*s* 6*d*

The editor of this volume, which runs to nearly 700 pages, has done his work very well. Apart from the usual business statements of the Conference, lists of members, etc., which are placed in a lengthy appendix, the book falls into two parts. The first consists of a summary of conferences, usually a somewhat dull affair but in this case extremely ably put together to show the trend of opinion in different groups from various countries. The Problems of the Pacific discussed might have been more clearly stated in the title, for they do not range over a wide field but are confined to diplomatic relations and economic and financial questions limited for the most part to the relations of China with other countries, especial stress being laid on Manchuria.

The second part consists of papers relating to the subjects discussed at the Conference and forming the groundwork of the discussions. Apart from a discussion of the wheat industry in Australia and a paper on treaties between the states bordering on the Pacific, eight papers discuss the economic and foreign relations of China, and five Manchuria, which is treated both from the point of view of its relations to the eighteen provinces, and to Japan, and the general economic, political, and diplomatic situation.

The book, which contains a mass of valuable statistical material, is not easy reading, but sets forth a great deal of information which will be of interest and value to all who are interested in the economic and political geography of the Far East. In one matter it fails lamentably: there are only four maps and these with one exception seem to have been originally prepared on so large a scale that they have lost their clearness in reduction. In spite of columns of statistics there is nowhere a graph to help point out the author's meaning. We are all aware of the additional cost of such necessaries, but where a volume like this has been obviously produced at great expense, and where the editor has spared himself no pains to produce a finished result, it is a matter for great regret that he has failed to call in the help of a draughtsman and so double the value of his labours. L. H. D. B.

GEOGRAPHIE DES ATLANTISCHEN OZEANS. By GERHARD SCHOTT. *Hamburg: C. Boysen* 1926. (Second edition.) 11×8 *inches;* xiv+368 *pages; illustrations, maps, and diagrams. M.*35

DIE GESCHICHTE DES ATLANTISCHEN OZEANS. By HERMANN VON IHERING. *Jena: Gustav Fischer* 1927. 10×7 *inches;* viii+238+(36) *pages; and maps.* 15*s*

In spite of their titles, these two volumes have but little in common: neither are they complementary, for Schott's is a book of extremely wide outlook dealing

with most aspects of the Atlantic Ocean, whereas von Ihering's is mainly a statement and defence of his "Archhelenis" hypothesis.

The mode of formation of the Atlantic Ocean is still a much-disputed question. Schott, in the necessarily limited space he can devote to this subject, contents himself with a statement of the three chief hypotheses; bridge continents, permanence of the ocean basins, and continental drift. While indicating that he has a preference for the hypothesis of the permanency of the ocean basins, he wisely says that the reader should choose for himself, and gives references to the appropriate literature. Von Ihering, on the other hand, pays very little heed to the views of others. His opinions are reached from a study of plant and animal distribution, a method which he thinks self-sufficient and conclusive. On the palaeontological side then, the ground is well covered: the evidence points to the former existence of a continent "Archhelenis" connecting Africa and South America which did not break up till Eocene and Miocene times. One might have expected from this that some points of contact with geophysicists would have been attained, especially with Wegener. On the contrary, the incompatibility of the two hypotheses is maintained. This is partly because palaeontological evidence does not support it in detail, but also, we feel, because the author has very little use for any method of approaching the problem but his own. Palaeontology is undoubtedly a strong weapon with which to attack the problem, but to describe Wegener's hypothesis as a "Phantasiegebilde" and a "Seifenblase" without meeting him on geophysical grounds as well, is not likely to carry much weight with readers.

It is a pleasure to turn to the second edition of Schott's book. It has been considerably enlarged, notably by a chapter on life in the ocean by Professor Hentschel and a new section on ebb and flow. History, geology, oceanography, meteorology, and economics are all dealt with in a very wide sense. Each section gives an account of its subject sufficient for the general reader and a well-chosen list of references for those who wish further information. Some sections in which the advance of knowledge is rapid will require frequent alteration. An instance of this is the section on oceanography. The results of the *Meteor* expedition were not available when the book went to press: as a result, extension of this chapter in some directions is already necessary. The close connection that exists between the fertility of the sea and the chemical oceanography is doubtless one which will be attended to in a revision. We hope too that all temperatures will be expressed in degrees Centigrade to obviate the possible confusion with the Celsius scale used in places.

A book of this nature must have a wide appeal. Some of the material given is not readily available elsewhere; much of it has only appeared in technical treatises. At the same time the matter is well displayed and ordered and the language is simple. The text is enriched with numerous coloured maps, photographs, and text figures which help the reader to follow the argument in the text and are often by no means wanting in artistic beauty. A. P. O.

MANUAL OF METEOROLOGY. Vol. III. The Physical Processes of Weather. By SIR NAPIER SHAW. With the assistance of ELAINE AUSTIN. *Cambridge: University Press* 1930. 11 × 7 *inches;* xxviii + 446 *pages; illustrations and maps.* 36*s*

This volume completes Sir Napier Shaw's monumental work on Meteorology as first planned. Volume ii, reviewed in this *Journal* for October 1928 (vol. 72, p. 368), was mainly geographical in its presentation of climatic conditions; this is a purely physical analysis of the conditions on which weather depends. It is a work for serious students of meteorology who possess a good knowledge of mathe-

matical physics and a determination to grapple with a difficult subject, in the presentation of which there is no mercy extended to halting seekers after truth. Any detailed criticism of the book would be out of place here.

We cannot hope to express the purpose of the volume better than does the author in his Preface: "The thermal principles operative in the atmosphere were found to be an essential part of the study of the physical properties of air. And the mode of treatment led automatically to the consideration—and then to the reconsideration—of the customary meteorological methods of dealing with the reaction of the atmosphere to the thermal treatment which it receives in the natural course. The reconsideration opened out upon some suggestions for the use of entropy as a meteorological element in various ways that invited exploration. In particular it has been found possible to regard an *isentropic surface* as a practical alternative for sea-level or some other *horizontal surface* on which to place the facts about the weather. Only the beginnings of the exploration have been made, and it is hoped to enlist the reader's assistance in its prosecution."

The unsatisfactoriness of reducing meteorological observations on all parts of the land-surface to sea-level has long been felt; but the conception of an isentropic surface which bears no fixed relation to sea- or land-levels is one which will require much study to elucidate, although we readily take from Sir Napier the validity and desirability of his method, which is expounded with his customary fullness of knowledge and agility of mind. H. R. M.

BY WAY OF CAPE HORN. By A. J. Villiers. *London: Geoffrey Bles* 1930. 10×8 *inches;* xii+228 *pages; illustrations and sketch-map.* 21*s*

For all those who are interested in sail and who wish to gain a clear idea of how a square-rigged, deep-water ship is run in these machine-ridden days, 'By Way of Cape Horn' provides exactly what is wanted. In this account of a passage from Wallaroo to Queenstown in the *Grace Harwar*, the last full-rigger afloat, the author goes into minutest details in his description of sea life—nothing is scamped—nothing is glossed over in this tragic narrative of hardship, hard work, and hard luck. Indeed a minor note runs through the whole book: Mr. Villiers, like all real sailors, never ceases to lament the extinction of sail. Then his chum is crushed to death by the fall of a topgallant yard owing to a rotten halliard chain, and he almost overloads the agony. His description of the funeral is one of the most impressive in sea literature known to the present writer, with an oration from the captain which could never have come from the lips of a British seaman. This is quickly followed by the nervous breakdown of the second mate, which is related with the utmost vividness.

Mr. Villiers is perhaps a little overfond of long digressions. He digresses to describe the last few deep-water sailing ships still striving to earn a living; he gives a lengthy outline of his early life at sea; and he puts down the yarn of one of his shipmates, telling of the passage of a ferry boat from England to Australia, which is a veritable saga of the present day. The illustrations, as one would expect from the author of 'Falmouth for Orders,' are really excellent and the book is well produced and of a size which is not too cumbersome and heavy. It undoubtedly forms a fitting epitaph for the old Cape Horner, which cannot last more than a few more years. B. L.

THE MONTHLY RECORD

CRUST-MOVEMENTS IN SWEDEN

The classical question, discussed for over two centuries, of changes of level in Scandinavia, has been attacked once more within the past few years by various investigators, Swedish and Finnish, the latest contribution being that of Folke Bergsten in the *Geografiska Annalen*, 1930, part 1. When beginning his study this writer proposed merely to calculate amounts of change revealed by the records of the principal mareograph stations, at ten of which long series of precise observations have been made. He afterwards extended the work so as to make use of the regular water-level observations at various other Swedish ports, and has thus been able to compute the changes at no fewer than twenty-five places, and to throw new light both on the intensity of the phenomenon at different points and its general course of development. Much of his paper is concerned with his method of work and detailed discussion of the observations at the several stations, into which it is unnecessary to enter here. The conclusions reached from the mareograph station records are that the land is rising at all the northern stations down to Landsort, and that a subsidence is taking place farther south, especially at Ystad. On the basis of the results at *all* stations for the period 1887–1927 the writer gives a chart in which lines of equal vertical movement have been drawn, the amounts being calculated in centimetres per annum. The maximum of 0·9 cm. occurs on a line, convex to the south-east, cutting the coast of Ångermanland in two places. Farther south the "isobases" run more regularly east and west (with a probable southward deflection in the interior of Southern Sweden), the values diminishing regularly until zero is shown a little before the extreme south is reached. Comparing these results with those of previous workers he finds certain differences, the chief being that the centre of greatest elevation is now placed rather more to the north than previously, and that the elevation is more marked. The writer also attempts to discover, on the basis of three exceptionally long series of water-level observations, whether the conclusions of geologists that the change of level has decreased in intensity from the melting of the ice-cap to our own day can be substantiated for the past hundred years. The result is again shown in a chart with lines of annual change during the period 1825–1927. It exhibits the same general features as the first, but the annual amounts are somewhat higher. Incidentally, fluctuations of level both of short and long period are disclosed, but these are almost certainly due to meterological causes and afford no proof of a decrease in the intensity of elevation during the past hundred years. Another result of the study is to indicate the composite character of the phenomenon as due to a small extent to change of sea-level and not solely to movement in the actual crust.

BURST OF A GLACIAL DAM IN ICELAND

The site of the phenomenon that occurred at the south end of the Langjökull on 16 August 1929 and was recorded under the above title in *G.J.*, March 1930, vol. 75, pp. 241–243, was visited in July 1930 by an English party, one member of which, Mr. B. H. Humble, has kindly supplied us with notes and photographs of the locality as he found it. He considers that the volume of water in the new fall can have suffered very little diminution since Mr. Seaver's visit, and is inclined to believe that the rock-channel, the dimensions of which he confirms as being about 300 yards by 40, was considerably deepened at the time of the bursting of the ice-dam. The water in the channel was yellowish white, with many lumps of ice floating on it, and had little perceptible movement. The height of the ice-wall on the north side of the channel seemed to him to be rather more than 30 feet.

He points out that the mountain appearing over the ice-wall in the third photograph in *G.J.* (*loc. cit.*), and there called Einifell, cannot be the Einifell marked in our sketch-map and at the edge of the Danish 1:50,000 sheet, but is a certain prominent peak about 2800 feet high some 2 miles from the fall to the north-east in the Jarlhettur range, which borders the Langjökull on the south-east, while the Einifell of the map figured as 1625 feet is only one of half a dozen inconspicuous foothills. There is still scope for an accurate survey of the locality to the north of the 1:50,000 sheet, and, as Mr. Humble remarks, it would be interesting to have a record of the renewed progress of the glacier across the channel.

NEW ORTHOGRAPHY OF TURKISH AND JAPANESE PLACE-NAMES

The *International Hydrographic Bulletin* for May 1930 contained a short article entitled "Transcription of Place-Names. Turkey," with a list of sixty-six coastal names in their so-called English, French, and new Turkish forms, the latter for some reason printed in ugly sans-serif capitals. Mention is made of a booklet, issued at Ankara in 1929 by the Directorate-General of the Administration of Vilayets, which gives complete lists of the administrative divisions of Turkey—vilayets (sixty-three), kazas, and nahiyes. A reference to this work reveals the fact that the *I.H.B.* list is not based on it and that the Turkish spellings given there must be used with caution. An attempt has been made to distinguish between the letter *i* with and without a dot; but a great many dots have been omitted. The *s* of Yesilköy (*sic*), the Turkish name of San Stefano, should have a cedilla, though this name does not appear in the official list. Izmit is now known as Kocaeli (pronounced Koja-ēli). The most serious mistake is that the Turkish name of Constantinople is given as Istambul (the initial *i* rightly with a dot), whereas it is officially written Istanbul, however it may be pronounced. This has been rectified in a footnote in the September number, which contains an additional article on the subject with a further list of sixteen place-names, and a glossary of over one hundred terms used in Sailing Directions. The spellings of the place-names are again not free from error. The cedilla is wrongly placed under the *c* of Erzincan and omitted in Corum; the *g* in Beyoglu and Eregli should have the sign ⌣ above it; the *i* in Aydin should have no dot; and Kütaya should be Kütahya.

The September number of the *International Hydrographic Bulletin* also has an article on "Transcription of Geographical Names. Japan," with a list of over seven hundred coastal names compiled by the Japanese Hydrographic Department for insertion in the new International Code of Signals. This Department, like the Land Survey Department, but few, if any, of the other Government Services, has adopted the Nippon Romazikwai system of romanization, particulars of which were given in the *Geographical Journal*, vol. 72, 1928, pp. 360–362. Many of the spellings appear strange to those accustomed to the Hepburn system. To take only the principal divisions: we find Karahuto for Karafuto, Tisima for Chishima, Honsyû for Honshū, Sikoku for Shikoku, Kyûsyû for Kyūshū, Nansei Syotô for Nansei Shotō, Tyôsen for Chōsen. Nansei Syotô is the name now favoured for the Ryūkyū (Chinese, Liu-ch'iu) archipelago, while the whole string of islands running south from Tokyo now appears to be included under the title of Nanpô Syotô.

GLACIERS OF THE KARAKORAM

In the Records of the Geological Survey of India (vol. lxiii, Part 2, 1930) Major Kenneth Mason publishes all the data he has been able to collect from the records of previous travellers of the present and past condition of thirty-four

glaciers in the Karakorum. Besides being a most useful contribution for the glaciologist, this publication will be invaluable to future travellers visiting this region. The author happily differentiates the forms of secular, periodic, and seasonal advance and retreat of these glaciers, phenomena which have often been confused in the past. The majority of these glaciers give indications of a secular retreat, that is, the ice left by the last ice age is still diminishing; the majority also of those glaciers which show periodic movement seem also to be in retreat, but the Chong Kumdan is a marked exception. Of this latter glacier a footnote on p. 224 indicates the author's disagreement with the official forecast in that he foresees another probable flood in 1931. This is borne out by a letter from Mrs. Visser dated 5 July last: she reports a big lake below Yapchan held up by an enormous ice barrier, which has evidently reformed since it burst in 1929.

ITALIAN EXPEDITION TO THE KARAKORUM

Letters received from H.E. Professor Giotto Dainelli record briefly the result of his visit to the Siachen and Rimu glaciers. The Nubra river became unfordable only fifteen days after he had reached the Siachen glacier, and in consequence he had to retain for the whole of his trip twenty coolies whom he had intended to send back to Nubra: this was a great strain on his supplies. After spending two months on the Siachen glacier he crossed by a new pass over on to the Rimu glacier, being hindered by a week of continual snowstorms. He left the Rimu by its northern arm leading into the head of the valley of the Yarkand river, finding that its front was greatly changed and had advanced since 1914, so that it presented great difficulties to his passage. Apart from the geographical results it is obvious that Professor Dainelli has successfully overcome an extremely difficult problem in transport and supply. After a brief rest in Leh, he returned to India late in the season through Rupshu, Lahul and Kulu.

THE CRATER OF KILIMANJARO

Although some fifty ascents of this mountain have already been made, and many photographs taken of outer slopes of the crater with their glaciers, such records of the phenomena within the crater have hitherto been few. During an ascent in March 1927 an excellent photographic panorama of the whole interior of the crater was secured by Herr H. Mostertz, and is reproduced in the March 1930 number of the *Zeitschrift für Vulkanologie*. This ascent, unlike most of the others, was made in the rainy season, and heavy snowfalls had occurred for some weeks previously, and the snow lay so deep that the traveller sank in it in places up to the hips. It was of an extremely loose powdery nature, the individual crystals being quite uncompacted. This is at variance with the statement often made that snow falling on the summit in the rainy months is wet and heavy. The writer points out that the climatic conditions must be very variable, for the accounts of travellers differ greatly both as to the extent of the glaciation and as to the condition of the snow and ice. The latter has sometimes been so furrowed by crevasses as to be impassable, while at others the snow-cover could be traversed with ease. Herr Mostertz noticed some deep cavities in the horizontal ice-surface, and asks whether, in the absence of outlet for the ice, these may not be due to melting during a belated phase of the volcano's activity. The note is accompanied by a list of all the ascents to the crater that can be traced down to 1928.

FURTHER WORK OF THE *SNELLIUS* EXPEDITION

We have received a second official report of this expedition summarizing its researches in the waters of the Malay Archipelago from January to April of this year. Two further instalments of the narrative have also appeared in the *Tijdschrift* of the Netherlands Geographical Society, July and September 1930. In

the early months of the year the special field of work lay in the Flores basin (north of the island of that name), the Saleier trough (east of that group), the Gulf of Boni, and the western and central parts of the Banda Sea. The echo-soundings were continued regularly and threw new light on the configuration of the basins and the underwater ridges separating them. The lowest parts of these ridges were determined where possible in order to elucidate the process by which ocean water of varying temperature can make its way across the ridges into the enclosed basins beyond, and the deductions drawn in this connection are of much interest.

In certain parts the results of the soundings show that the charts need considerable correction. Previous work had indicated that as a whole the sea-bottom in the Archipelago is fairly even, many of the basins being of regular form with steep margins. But in the central parts examined later much greater irregularities were disclosed. Thus the Flores Sea, though bounded on the north by atolls and islands subject to no great tectonic activity, was found to be traversed by a number of submarine ridges running east and west. On the other hand the Savu Sea, enclosed by some of the most active islands of the whole archipelago, has a nearly flat bottom. The portion of the former deeper than 5000 m. is a syncline 250 km. long with a breadth of only 12 km. The Central Banda Sea was also found to have a more irregular floor than had been supposed. Especial attention was paid to the Strait of Obi, through which Pacific water can pass at no greater depth than 1850 m. Here detailed observations were taken of the strength of the current at varying depths, the result being to show a northward movement down to 200 m. and a southward one between 350 and 500 m. Samples of the sea-bottom were taken with the special apparatus, and one core was obtained of the record length of 174 cm. Distinct traces of stratification were disclosed, and the regular deepening of colour downward was maintained throughout the longest samples. Bottom deposits were scanty on sills exposed to the action of currents, but elsewhere their depth proved unusually great. The geologists made some study of the way in which islands have grown up on reefs originally formed when the sea-level was higher than it is now.

RECENT VULCANISM IN THE ABYSSINIAN RIFT VALLEY

In the *Zeitschrift für Vulkanologie* for March 1930 Dr. Hans Reck discusses the volcanic phenomena of geologically recent age which exist in the Abyssinian rift-valley in the part traversed by the Addis Ababa railway, with its northward expansion funnel-wise into the Danakil lowland. Although of importance for the general tectonics of the region these phenomena have been little studied by competent observers so that no complete picture of them is to be had from existing literature. Some new light has lately been thrown upon them by journeys in 1928 and 1929 of Dr. Melchens of the German Legation in Addis Ababa, accompanied in the latter year by Messrs. Wagner and Neitzel. Excellent photographs by the first two of these travellers accompany the article, and Dr. Reck's conclusions are in part based on these. He points out that the clustering of volcanic peaks just where the rift-valley begins to widen out northward has a tectonic significance, and that the north–south alignment of the two western peaks, Dofan and Fantale, is evidently connected with other meridional lines observable in the rift-valley and its bounding walls. This view is supported by recent observations on Mount Fantale by Dr. Rohleder published in the same number of the *Zeitschrift*. The tectonic importance of this north–south direction is borne out by the similar alignment of the volcanic peaks from Errer to Zukwala, east and south of Addis Ababa. The two peaks named with their heights of about 3000 m. are the most important of the recent volcanic structures of Abyssinia, but little has been known of their true nature. Intermediate between them is the Adda group.

with the associated crater-lakes, one of which is close to the railway station Les Addas. These lakes are well pictured by the photographs recently obtained. The general conclusion drawn is that a certain phase in the rift-valley formation was associated with a widespread volcanic reaction, extending over a lengthened period. The resulting volcanoes are now extinct or nearly extinct, and have already been subject to a general process of degradation. A later phase was of a different character, being marked by the wide dispersal of the points of eruption and the nearness to the surface of the focus of explosion. The idea that any of the peaks have been quite recently active is discredited.

CONTINENTAL DISPLACEMENT AND MOUNTAIN BUILDING

In *Petermanns Mitteilungen*, 1929, pp. 230–234, Ingolf Ruud endeavoured to explain the arcuate form of the mountain ranges and island festoons of Eastern Asia, and he has now, *Petermanns Mitteilungen*, 1930, pp. 119–124, 174–180, developed his ideas into a general theory of continental displacement and mountain-building. He attributes both to thermal contraction, but the contraction does not proceed in the manner that has usually been supposed. Like Arrhenius he thinks that beyond a certain depth beneath the surface the critical temperature of the materials is exceeded and consequently the interior of the Earth must be gaseous. Owing to the great pressure this is not incompatible with a high degree of rigidity so far as short-lived stresses are concerned.

Contraction due to cooling is greatest when the material passes through the critical temperature, and as the Earth cools this temperature will be reached in successive concentric shells of the Earth, proceeding from the outside inwards. Roughly, we may consider the globe as consisting of a contracting shell enclosed by shells in which contraction has almost ceased and enclosing shells in which contraction has scarcely begun. If the contracting shell were empty, and strong enough, its contraction would be undisturbed and the outer shells would collapse upon it under the force of gravity. But since the contracting shell is filled by material which does not contract, it must fracture, and by hydrostatic pressure the material from below is forced into the fractures, pushing apart the separate pieces of the shell. Ruud appears to think that these fractures will extend into the overlying shells, and that considerable continental displacement may be produced. For mountain-building movements it is necessary to take into account the decrease in the thickness of the contracting shell as well as the decrease in its circumference. In his quantitative investigations Ruud assumes throughout that Van der Waals' equation is applicable.

THE ATLANTIS PROBLEM

Some four years ago a revolutionary interpretation of Plato's story of Atlantis was put forward in *Petermanns Mitteilungen* by Paul Borchardt, and was referred to in the *Journal*, vol. 70, p. 318. Borchardt's papers elicited replies from other writers, both in the *Mitteilungen* and elsewhere, mostly unfavourable to the theory. This placed Atlantis not beyond the Strait of Gibraltar (the generally accepted site of the "Pillars of Heracles") but in a former gulf of the sea in Southern Tunisia leading out of the Syrtis, and now represented by the salt basin of the "Shotts." An outcome of the discussion has been the visit to the locality of more than one student, besides Borchardt himself, with a view to testing how far the ground itself harmonizes with Plato's description. One of these was Professor Passarge, who failed to find confirmation of the theory, and another Dr. A. Herrmann, who had supported Borchardt's view from the first and has found no cause to abandon it after a careful examination of the ground, reinforced by a study of previous literature, especially on the geological side (*Pet. Mitt.*,

1930, Nos. 7/8 and 9/10). Particularly valuable is the work done over fifty years ago in connection with Roudaire's scheme for letting in the sea into the basin of the Shotts. Dr. Herrmann gives a geological profile on the basis of the borings then made, and endeavours to trace the physical history of the basin through the historic period. He maintains that some 1200 years before Christ there must have been water communication between the interior basin and the Mediterranean, but that this was eventually interrupted by the earth-movement which, while tilting the whole lake-bed, produced a definite ridge near Gabes. The access of sea-water being thus shut off, the basin has been subjected to progressive desiccation, as is shown by the old shore-lines, some of which Dr. Herrmann traced for considerable distances. As none of the remains of the Roman period are below the old shore-line he places the final separation from the sea in post-Roman times.

Dr. Herrmann holds that these changes are in harmony with historic tradition, both classical and Arab, and that if Plato's story can thus be explained (even to the detail of the sea of mud) it is unreasonable to dismiss it as a mere fable, though some parts of it may have been distorted in being handed down from one authority to another. Plato himself was misled by the changed application of the names which had supervened since the story was first told by the Egyptian priest. A difficulty remains in the exaggerated estimates of size assigned to the city of Poseidon and its surroundings, and Dr. Hermann gets over this in an ingenious but not entirely convincing way. He dwells on the fact that practically all the figures given are divisible by 30, and argues that they are 30 times too great through an error in the conversion of the Egyptian *schoenae* into feet and stadia.

Dr. Hermann thinks that he has discovered actual traces of old canals at a point near the mouth of what he considers to have been the ancient river Triton, falling into the basin from the south-east. He contends that a site in Southern Tunisia for an old centre of civilization fits in well with the statement that its influence extended to Egypt and the Tyrrhenian lands (Italy). He urges the importance of further research in this region, where the vestiges of such a civilization may lie buried under the encroaching sands of the desert. It is probable, he thinks, that Greece herself may have owed a good deal to a predecessor in this quarter. His contentions are perhaps unlikely to gain general approval, but can hardly be brushed aside as unworthy of careful consideration.

CENTENARY MEETING OF THE BRITISH ASSOCIATION

In connection with the Centenary Meeting of the British Association, which will be held in London from 23–30 September 1931, the Organizing Committee of Section E (Geography) announces that papers received by March 1 will be considered at the ensuing meeting of the Organizing Committee. Papers received later can only be considered for such places in the programme as may still be open. Communications may be addressed to the Recorder of the Section, Mr. R. H. Kinvig, the University, Birmingham.

OBITUARY

CAPTAIN OTTO SVERDRUP

Captain Otto Sverdrup, whose death took place on 26 November 1930, was the last of three great Norwegian explorers. As in the case of Amundsen, he owed his initial inspiration to Nansen; and these three at one leap have placed Norway among the leading countries in polar work, accomplishing feats not unworthy to rank with Leif Ericsson and Karlsefni.

Sverdrup was one of Nansen's companions on the First Crossing of Greenland in 1888. At that time he was thirty-three years of age; he had gone to sea at the age of seventeen, secured his mate's ticket at twenty-three, and after being captain on a schooner and on a steamship had finally retired from the sea, and settled down to forestry and farming. Nansen, it may be recalled, had great difficulty in landing on the east coast of Greenland, and the successful penetration of the rapidly drifting pack-ice was largely due to Sverdrup's skill in small boats. Throughout the expedition Sverdrup was Nansen's right-hand man, and few decisions were made without his advice and help.

The Greenland crossing brought fame to Nansen and to his companions, but it was the prelude only to a still closer and enduring association with his chief lieutenant. Five years later, on 24 June 1893, the *Fram* steamed out of Christiania Fjord on one of the greatest of all polar voyages with Sverdrup as captain of the ship. Nansen planned to sail her as far east as possible by the North-East Passage, and then to allow the ship to drift with the pack across the unknown Polar Basin. Cape Chelyuskin was passed on September 10, the Nordenskiöld Sea crossed in the ensuing ten days, and the *Fram* deliberately placed in the ice and frozen in on September 25 at a point north of the New Siberian Islands. In the first winter little progress was made; the rate of drift improved in the next twelve months; but in the spring of 1895 Nansen, realizing that the ship was unlikely to drift much nearer to the Pole, decided to leave the ship and attempt with one companion to reach the North Pole by sledging. Nansen and Johansen finally set out in March 1895. Sverdrup, left on the *Fram*, spent a third winter in the ice. In May 1896 lanes and pools of water began to form near the ship, and steam was raised on July 17. Progress however was still very slow and the ship was not entirely free till August 14. The *Fram* reached Tromso on August 24, forestalling Nansen by one day, and by now the most famous of Arctic ships.

Two years later Sverdrup took the *Fram* on a second expedition, this time as leader, with the intention of exploring round the north of Greenland. Hindrances were encountered in Smith Sound, and the *Fram* was forced to winter a little to the south of Bache Peninsula. There were further difficulties the next summer; plans were changed, and a second winter passed a little inside Jones Sound. The change was a fortunate one, and later, in the spring sledge journeys, immense areas of unexpected new land were found west of Ellesmere Land. As a consequence, the ship was moved to the head of Jones Sound for a third winter. Ultimately however a fourth winter was necessary, as she failed to free herself in time; this appears to be the only occasion of four successive winters being spent by an exploring ship in the Arctic. Sverdrup's expedition uncovered new land of almost greater area than all the combined discoveries of the Franklin search expeditions. In his exploratory sledge journeys he was ably seconded by Gunnar Isachsen, and the charts produced rank among the best reconnaissance maps of polar regions. The *Fram* returned to Norway in September 1902. Honours were now showered on Sverdrup, and among the first was the award of the Patron's Medal in 1903. He lectured to the Society that same year, and in the

ensuing discussion the first speakers were Sir Leopold McClintock and Sir Vesey Hamilton, both of whom recalled their sledging experiences from this same region after an interval of fifty years.

Sverdrup had returned from the second voyage of the *Fram* at the age of forty-eight. He had already a reputation for strength and energy far beyond his years, but showed it still more decisively ten years later when in 1914–15 he led a relief expedition to the Kara Sea in search of the lost Russian explorer Brussilow. With the *Eklipse* he struck out into the Kara Sea and reached as far as Lonely (Einsamkeit) Island. He then wintered his ship at Cape Wild on the Taimyr Peninsula. This expedition is notable for its pioneer use of wireless telegraphy. Sverdrup was able to speak to the station on Yugor Strait, 700 miles away, and report to the Russian Admiralty at St. Petersburg the position of Vilkitski's ice-breakers then making the North-East Passage. In the spring of 1915, at the age of sixty, Sverdrup himself sledged along the coast to the Chelyuskin Promontory and met Vilkitski.

Sverdrup was to lead one more expedition. In 1920 he was placed by the Norwegian Government in command of the *Sviatogor*, at that time in British possession, to take her to the Kara Sea. Here he rescued the passengers and crew of the Soviet ship *Solowei Budimirowitsch*, which had been carried the year previous by ice-drift eastwards through the Kara Strait.

Few would have been surprised if Sverdrup had been called on again and placed in charge of the Nobile relief expeditions. His reputation for many years had been greater than that of any other Arctic explorer, and his tradition in this respect has markedly contributed to make Norway supreme in ice navigation. His last honour in this country was his receiving an honorary degree from St. Andrews University in 1926 on the occasion of Nansen's installation as Lord Rector. The public memory is a short one, and it was a very great pleasure to his admirers in this country to find in this unexpected tribute that the veteran explorer was not forgotten and that his support and friendship with Nansen was thus publicly remembered. J. M. W.

At the opening of the Evening Meeting of the Society on 1 December 1930 the President said: "Before calling upon our lecturer I should like to refer to what we have all noticed, with very great regret: the announcement of the death of Captain Otto Sverdrup. More than one newspaper has spoken of him, very properly, as a prince of polar navigators and a perfect ice-master. His reputation would have been made, if by nothing else, certainly by his great journey when as captain of the *Fram* from 1893 to 1896 he sailed across the Polar basins. He was an Honorary Member of our Society. No better epitaph of Otto Sverdrup can be given than that he was a lifelong friend and most trusted companion of Fridtjof Nansen."

ADMIRAL E. DE VASCONCELLOS

We record, with deep regret, the death, on November 16, of Admiral Ernesto de Vasconcellos, since 1901 an Honorary Corresponding Member of the Society, and for many years the permanent Secretary, and moving spirit, of the Geographical Society of Lisbon. In early life Admiral Vasconcellos had seen service in the Portuguese colonies, and he was drawn to the study of their early history and of their economic problems. Much of his published work was devoted to vindicating the achievements of the early Portuguese navigators and explorers, though his interest in historical geography was not confined to that epoch. He was also Professor of Geography in the "Escola Colonial" at Lisbon, organized in connection with the Geographical Society.

MEETINGS: SESSION 1930–1931

First Afternoon Meeting, 10 November 1930. The President in the Chair

Paper: Gravity Anomalies in the Indian Archipelago. By Dr. F. A. Vening Meinesz

Second Evening Meeting, 17 November 1930. The President in the Chair

Elections: Lt.-Col. Percy Stuart Allan, D.S.O.; Miss Ethel Barker; Jatindra Nath Bose; Archer Francis Lawrence Clive; Lt.-Commr. George Francis Gilliland, R.N.V.R.; George C. Gooding; Major Thomas Donald de Gruyther; Mrs. Norah Rowan Hamilton; Mrs. E. M. Harvey; Capt. Thomas Hughes; Major E. H. T. Lawrence, O.B.E.; The Rt. Rev. Arthur Lea, D.D.; Miss Mary Longueville; G. Carmichael Low, M.A., M.D., C.M., F.R.C.P., F.Z.S.; the Rev. Daniel Murdoch Maclaren; Antony Macnaghten; Major James Gerald Guy Mellor, M.C.; Miss Ivy Kathleen Miller; Christopher Eden Minns; Sub-Lieut. Andrew L. Nelson, R.N.; Robert Norman; N. E. Odell; the Rt. Hon. The Earl of Onslow, D.L., F.S.A.; the Rev. Gerald Webster Page, R.N.; William Frank Perry; William Peyton Phelps; Capt. Thomas Gustavus Rochfort-Wade, M.A., B.SC.; Thomas E. Rofe; Right Hon. Sir John Simon, G.C.S.I., K.C.V.O.; Lady Simon; Bevil Warington Smyth; George Herbert Taylor; Ebenezer Arnold Leonard Ward; John Mansfield Weatherby; William Alfred Welch

Paper: By Submarine through the Netherlands East Indies. By Dr. F. A. Vening Meinesz.

Third Evening Meeting, 1 December 1930. The President in the Chair

Elections: Capt. R. B. W. G. Andrew, M.C.; Dr. S. A. Barrett; Alfred Edwin Peto Bennett; Charles Peto Bennett, Jnr.; Dr. Gilbert Hugh Bickmore; Mrs. E. A. Broome Giles; Ivor Granville Brown; Frank Clayton; Lady Cordeaux; A. B. Cumming; Miss Isobel Ogilvy Dalgleish; Colonel James William Ogilvy Dalgleish; Rt. Hon. the Earl of Eldon; Edmond Arnold Louis Gevaerts; Major-General Wulff Henry Grey, C.B., C.M.G.; Miss Dorothy Maude Allan Hay; Henry Calverley Hinton; Geoffrey Eliot Howard; Lt.-Col. John Charles Pleydell Howis, M.C.; Capt. Thomas Ivor-Moore, M.C.; Benjamin Jackson, B.A.; Mrs. George Lawless; Thomas Frederick Legge; William Vaughan Lewis; Grierson Macara; Capt. Francis McDermott, I.A.; Mrs. Charles H. Merz; Henry Morrell, O.B.E.; Eric Stephan Norin, M.A.; Arthur Walbridge North; W. W. Reville Terry; Cuthbert C. Rice; Macpherson Robertson; Edwin John Smith; Capt. Ralph Alfred Erskine Somerville, M.C.; Capt. Sydney Charles Tomlin; Adrian Floyer Williams

Paper: The Isoko Country, Southern Nigeria. By the Rev. J. W. Hubbard

Second Afternoon Meeting, 8 December 1930. The President in the Chair

Paper: The Earthquake off the Newfoundland Banks of 18 November 1929. By Professor J. W. Gregory

Fourth Evening Meeting, 15 December 1930. The President in the Chair

Elections: A. A. Allen, M.A.; Frank Gordon Clegg; Frank Crawshaw; The Hon. H. Percival Dodge, A.B., LL.B.; Leonard Fairclough; Miss Inez Fearn; Andrew Fleming; N. D. Gothi, M.A.; Miss Mary Louisa Harris; Miss Dorothy May Hoyles; Richard Meredith Jackson; Richard Lindley; Capt. Henry Greame Lloyd; Major Edward Ernest Long, C.B.E.; Alexander MacIntyre; Alastair Russell MacWilliam; Richard Thornton Nevill; Robert L. Ripley

Paper: An Air Reconnaissance of the Hadhramaut. By Squadron Leader the Hon. R. A. Cochrane

UNIV... CH...

Part of
CENTRAL SOUTH ARABIA
from a route traverse
by
BERTRAM THOMAS
1930

Scale 1 : 1,000,000

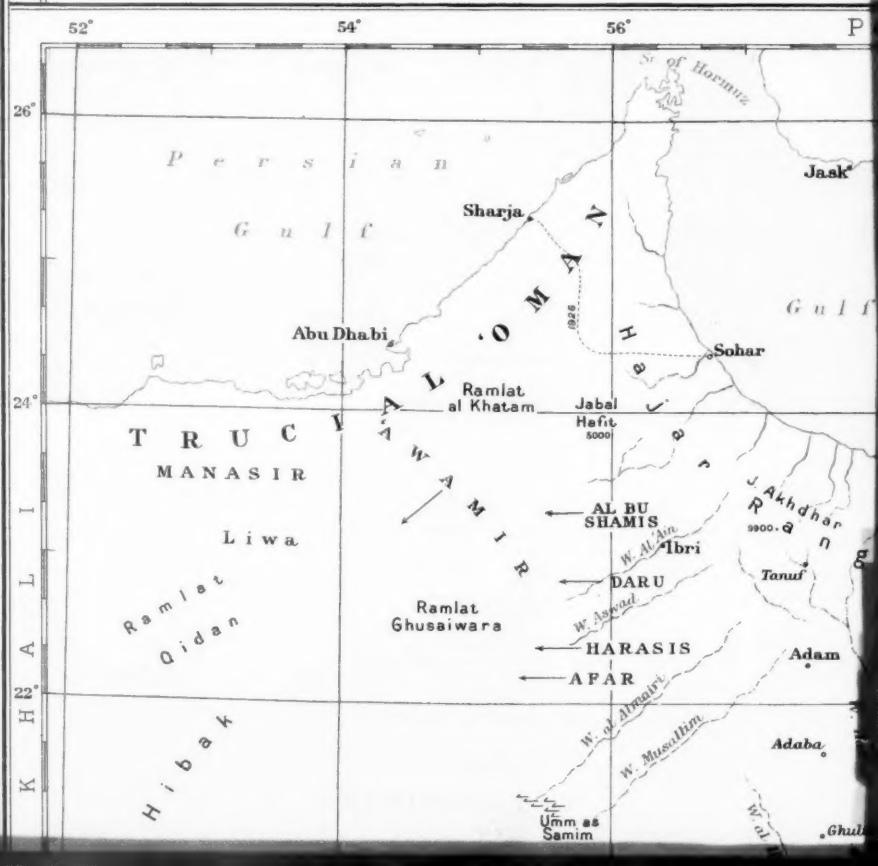
10 0 10 20 30

Statute Miles

Reference

Author's routes
Caravan halts
Heights in feet 1740
Wadis ..... (Dry)
Water holes

Sand
Acacia jungle
Scrub
Frankincense



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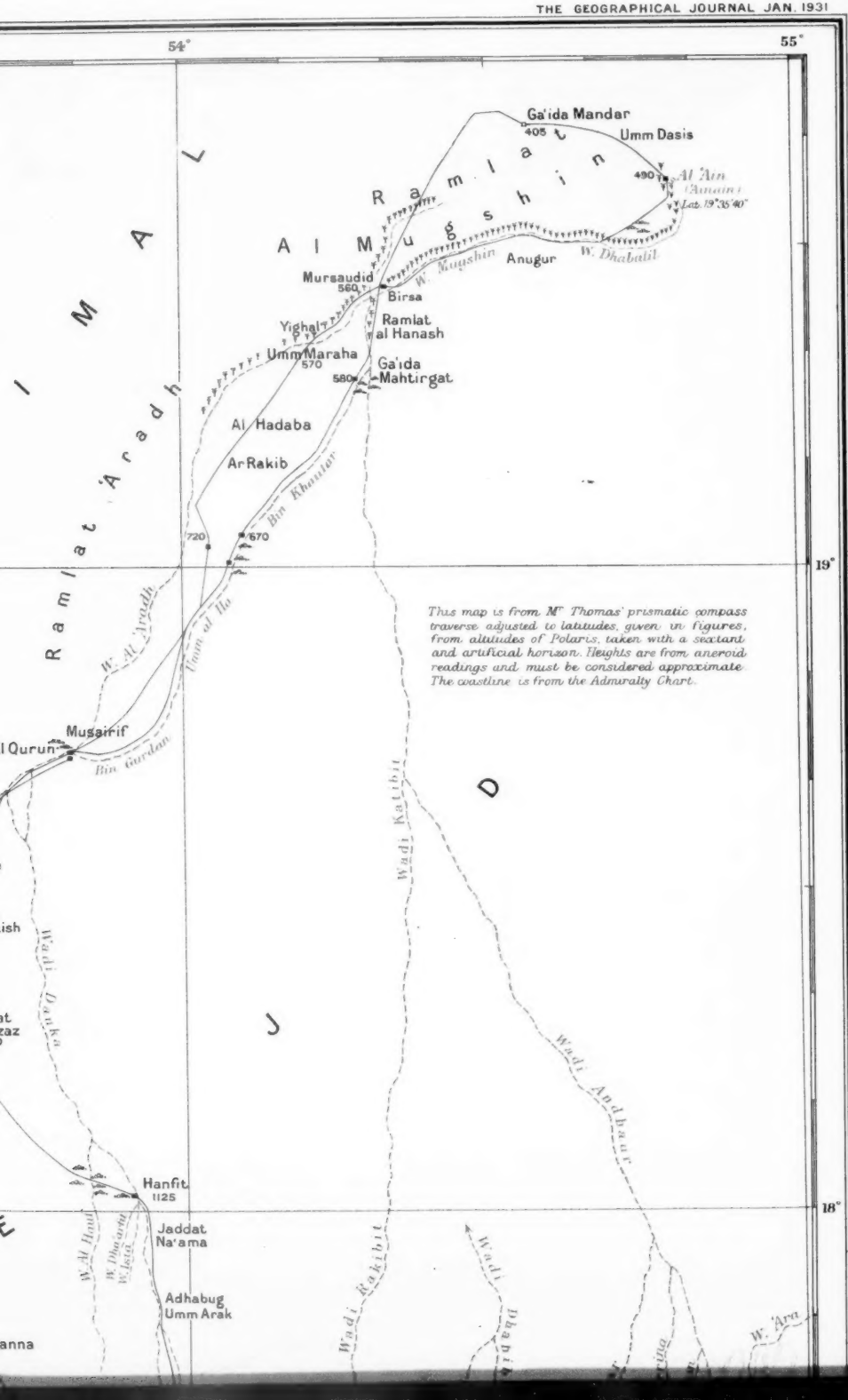
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580
Al Hadaba
Ar Rakib
Bin Khuntar
720
670
Ramlat Aradh
W. Al 'Aradh
Umm al Ho
This map is from Mr Thomas' prismatic compass traverse adjusted to latitudes, given in figures, from altitudes of Polaris, taken with a sextant and artificial horizon. Heights are from aneroid readings and must be considered approximate. The coastline is from the Admiralty Chart.
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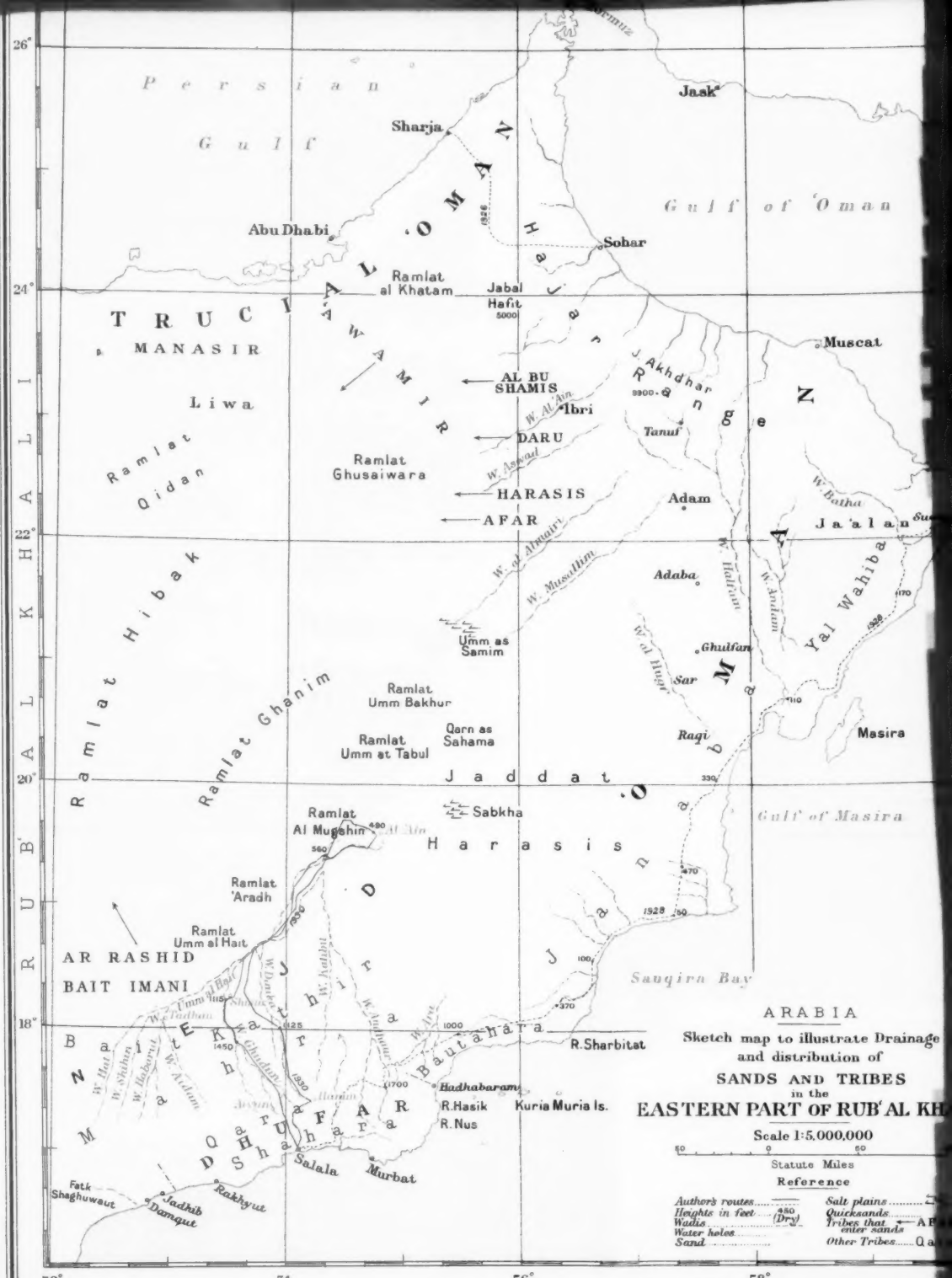
Persian Gulf
Gulf of 'Oman
Jask
Sharja
Abu Dhabi
Sohar
Ramlat al Khatam
Jabal Hafit
5000
TRUCIAL 'OMAN
MANASIR
Liwa
Ramlat Qidan
AL BU SHAMIS
DARU
HARASIS
AFAR
Ramlat Ghusaiwara
Muscat
Ibri
Tanuf
Adam
Ja'alan
Sur
Adaba
Ghulfan
Masira
Umm as Samim
Ramlat Umm Bakhur
Qarn as Sahama
Ramlat Umm at Tabul
Ramlat Hibak
Ramlat Ghanim
Jaddat Harasis
Sabkha
Ramlat Al Mugshin
Ramlat 'Aradh
Ramlat Umm al Hait
AR RASHID
BAIT IMANI
Gulf of Masira
Sauqira Bay
R. Sharbitat
Hadhabaram
R. Hasik
R. Nus
Kuria Muria Is.
Salala
Murbat
Fatk Shaghuwaut
Jadhib
Damgut
Rakhyut
ARABIA
Sketch map to illustrate Drainage and distribution of
SANDS AND TRIBES
in the
EASTERN PART OF RUB' AL KH
Scale 1:5,000,000
Statute Miles
Reference
Author's routes
Heights in feet
Wadis
Water holes
Sand
Salt plains
Quicksands
Tribes that enter sands
Other Tribes
52°
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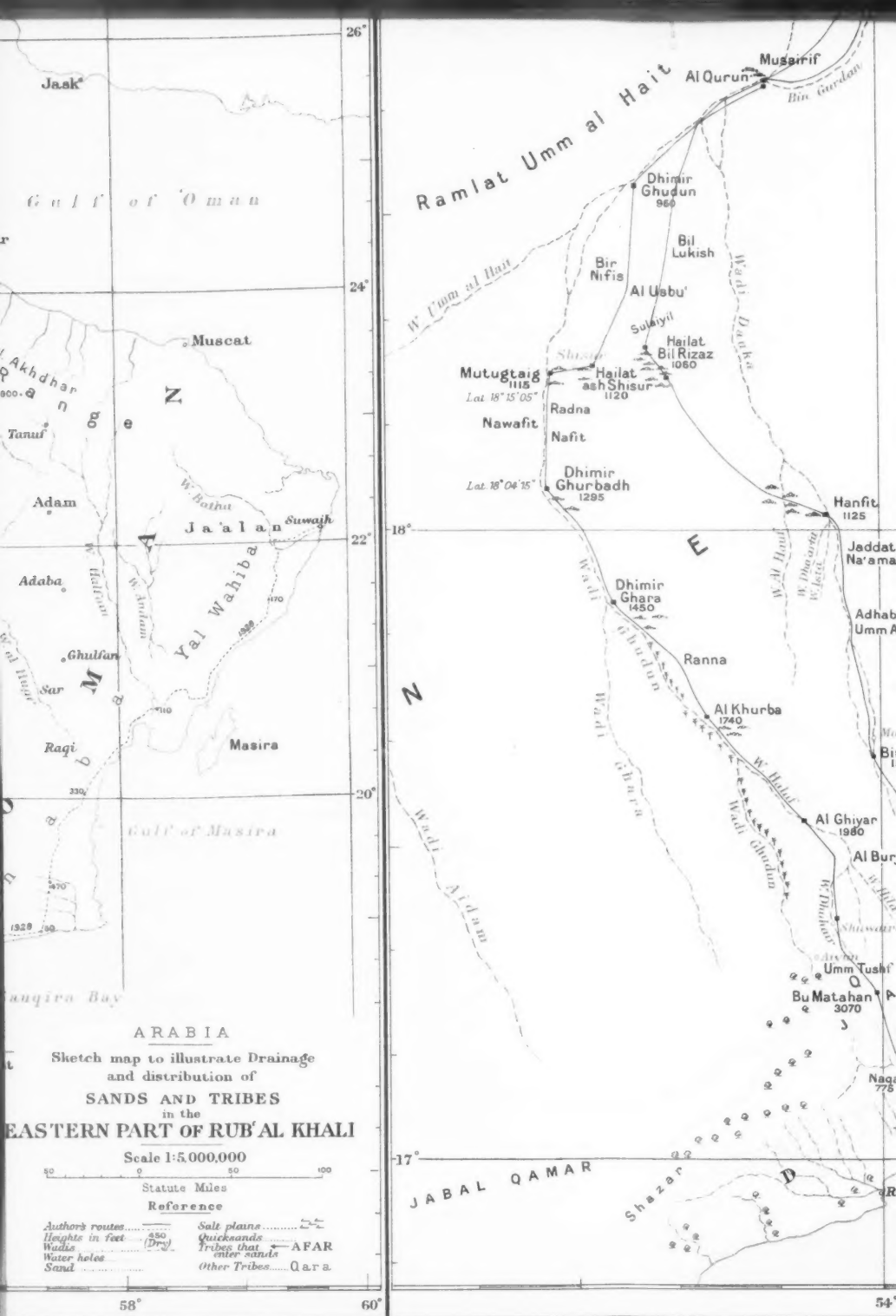
56°
58°



ARABIA

Sketch map to illustrate Drainage and distribution of

SANDS AND TRIBES

in the

EASTERN PART OF RUB' AL KHALI

Scale 1:5,000,000

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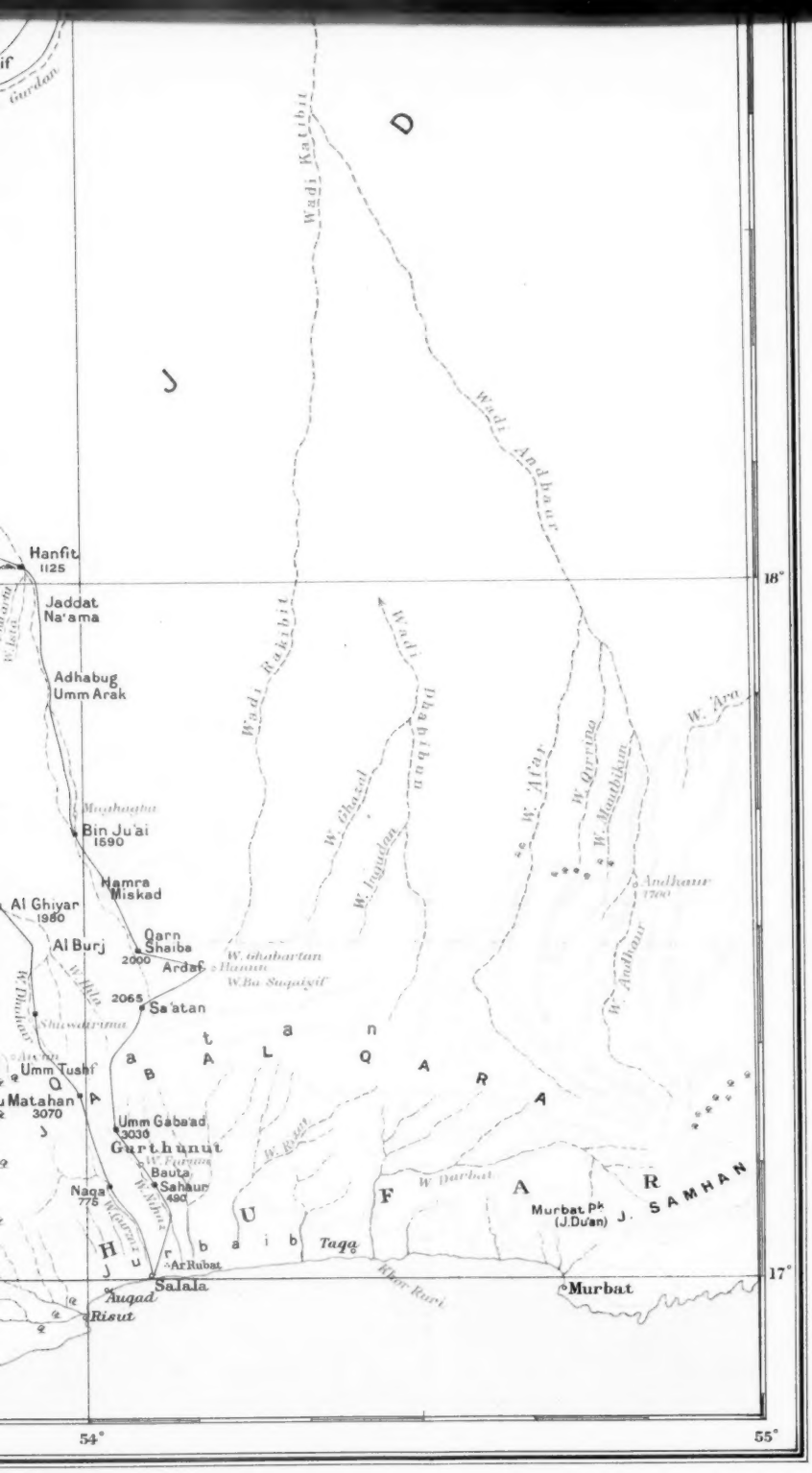
Statute Miles

Reference

Author's routes
Heights in feet 450 (Dry)
Wadis
Water holes
Sand
Salt plains
Quicksands
Tribes that enter sands — AFAR
Other Tribes — Qara

Published by the Royal Geographical Society



CENTRAL S. ARABIA
Thomas